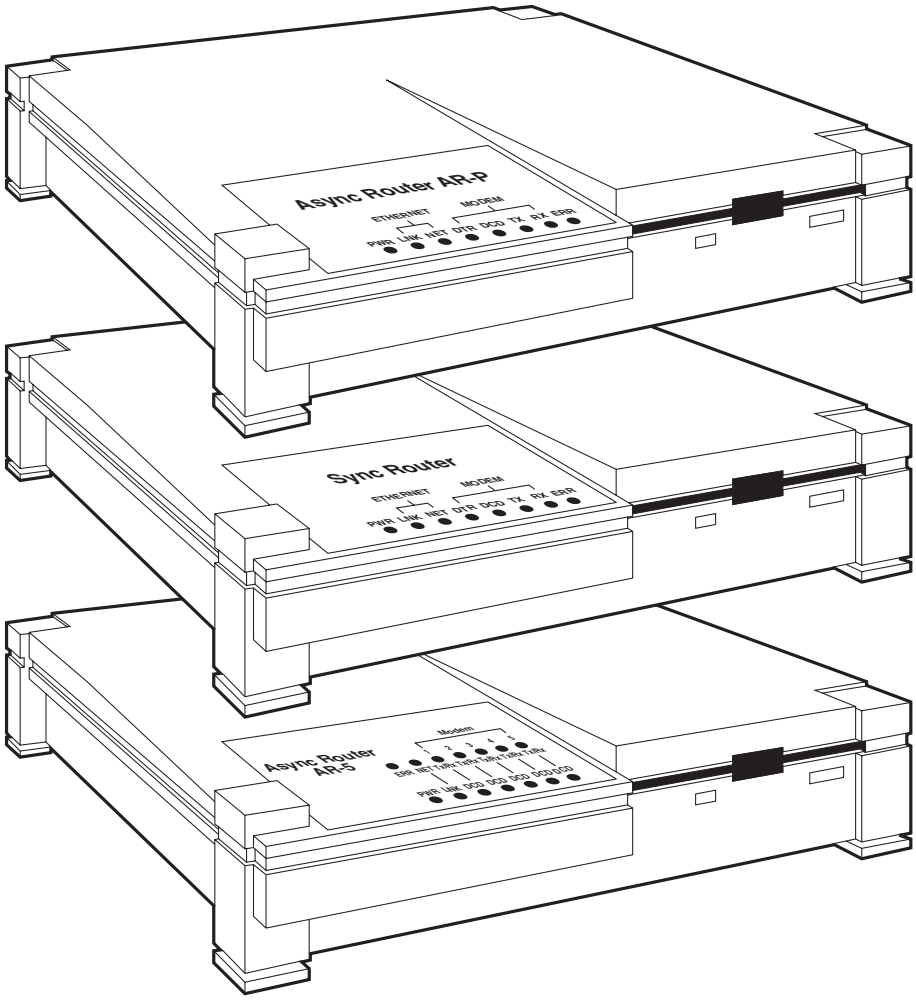
BLACK BOX®
NETWORK SERVICES

MARCH 1996
LRA001A-R2
LRA005A-R2
LRS002A-R2

Async Router AR-P
Async Router AR-5
Sync Router



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INSTRUCCIONES DE SEGURIDAD (Normas Oficiales Mexicanas Electrical Safety Statement)

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
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7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.
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11. El aparato eléctrico deberá ser connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.
12. Precaución debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
    - A: El cable de poder o el contacto ha sido dañado; u
    - B: Objectos han caído o líquido ha sido derramado dentro del aparato; o
    - C: El aparato ha sido expuesto a la lluvia; o
    - D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
    - E: El aparato ha sido tirado o su cubierta ha sido dañada.

This manual consists of two documents: a User's Guide and a Reference Guide. The User's Guide begins on page 5 and the Reference Guide begins on page 137.

TRADEMARKS

MARCH 1996
LRA001A-R2
LRA005A-R2
LRS002A-R2

Async Router AR-P
Async Router AR-5
Sync Router
USER'S GUIDE

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1. Specifications

1.1 General

Standards—Ethernet: IEEE 802.3 AUI, 10BASE-T; V.32 bis/V.42 bis

Speed—10-Mbps Ethernet; 28.8-Kbps integrated modem

Protocols—IP, IPX™

Integrated Modem—V.34 bis with V.42 bis

Diagnostics—Via LEDs or management code (supports Telnet login), SNMP

Connectors—All models: (1) DB9 male, (1) DB15 AUI female, (1) RJ-45 female, (1) 5-pin DIN; LRA001A-R2: (1) RJ-11; LRA005A-R2: (5) RJ-11; LRS002A-R2: (1) RJ-11, (1) DB25 female

Humidity—20-80% (non-condensing)

Operating Temperature—32° F to 122° F (0° C to 50° C)

Power—100-200 VAC, 60/50 Hz, external power supply (autoswitching), 0.6 A max.

Size—All models: 2.3"H x 9.8"W x 8.3"D (5.8 x 25 x 21 cm)

Weight—LRA001A-R2: 3.6 lb. (1.6 kg), LRA005A-R2: 4.3 lb. (1.9 kg), LRS002A-R2: 4.1 lb. (1.8 kg)

1.2 Connector Specifications

Table 1-1. IEEE 802.3 AUI, DB15 Connector.

Pin Number	Signal
Pin 1	Gnd
Pin 2	COL+
Pin 3	TXD+
Pin 4	Gnd
Pin 5	RXD+
Pin 6	Gnd
Pin 7	NC (not connected)
Pin 8	Gnd
Pin 9	COL-
Pin 10	TXD-
Pin 11	Gnd
Pin 12	RXD-
Pin 13	+12V
Pin 14	Gnd
Pin 15	NC

NOTE

The maximum length of the transceiver cable cannot exceed 164 feet (50 meters).

Table 1-2. 10BASE-T, RJ-45 (8-Pin) Connector.

Pin Number	Signal
Pin 1	TPO+
Pin 2	TPO
Pin 3	TP1+
Pin 4	NC
Pin 5	NC
Pin 6	TP1-
Pin 7	NC
Pin 8	NC

Table 1-3. DB9 Connector.

Pin Number	Signal
Pin 1	DCD
Pin 2	RXD
Pin 3	TXD
Pin 4	DTR
Pin 5	Gnd
Pin 6	DSR
Pin 7	DTR
Pin 8	CTS
Pin 9	RI

Table 1-4. Power Input Connector.

Pin Number	Signal
Pin 1	COM
Pin 2	Case
Pin 3	+5V
Pin 4	-12V
Pin 5	+12V

Table 1-5. RJ-11 Connector.

Pin Number	Signal
Pin 3	Tip
Pin 4	Ring

2. Introduction

This chapter introduces Router technology, features, and applications. Installation instructions begin in **Chapter 3**.

If you are upgrading a previous version of the Router, make sure you read *Appendix C* in the *Reference Manual*.

The Routers are remote access servers that route TCP/IP and IPX (NetWare®) traffic. Routers connect remote local area networks (LANs) and clients to Ethernet-based LANs, using standard V.34 modems, or synchronous lines (leased or switched). Personal computers can access Router servers using the Async Client software. Macintosh® and other non-PC clients can dial into a Router using the standard point-to point protocol (PPP).

Three models are available:

Table 2-1. Router Models.

Model	WAN Capabilities
Async Router AR-P (LRA001A-R2)	1 V.34 modem
Async Router AR-5 (LRA005A-R2)	5 V.34 modems
Sync Router (LRS002A-R2)	1 sync interface, 1 V.34 modem

2.1 Applications

All Router models provide autosensing Ethernet interfaces (10BASE-T, AUI), and support multiple protocols for both LAN-to-LAN and user-to-LAN (remote-client access) routing. All Routers have an internal V.34 modem (the AR-5 model has five internal modems).

2.1.1 Transparent LAN-to-LAN routing

For transparent routing between separate Ethernet-based LANs, pair two Routers together or use compatible devices. Use any Router model to provide inexpensive networking solutions for remote of fices. For maximum throughput, use the Sync Router for synchronous connections.

2.1.2 Transparent Remote Client Access

For remote client access, the Router acts as a remote node server, allowing IPX- and TCP/lP-based PCs and laptop computers to become remote nodes on an Ethernet-based network attached to the Router. Remote client workstations can then dial into the Router to access services on the LAN as if they were local nodes. The Router supports transparent access for a maximum of 100 remote clients, and accepts calls from any client on any dial-up modem line configured for client access.

2.1.3 Remote Clients and LANs with Dual-Stack Functionality

Router supports dual-stack functionality in both remote LAN-to-LAN and remote client operations. IP and IPX protocols are supported, so that any DOS or Windows® based PC, Macintosh, or UNIX® workstation can access the Router. The Router uses the standard PPP protocol, which allows third-party client applications to access the Router.

2.2 Shared Router Features

All Router models share the following features:

- Included or optional internal 28.8K modems (V.34)
- IP and IPX routing, separately or simultaneously
- PPP, IPCP, IPXCP, PAP, and CHAP protocols
- Remote client access (supports a maximum of 100 clients):
  - time filter
  - connect quota
  - idle timeout
  - security callback
- Extensive IP and IPX packet filtering on all interfaces
- Simple configuration for all supported interfaces: Ethernet, modem, and synchronous interfaces
- Superior handling of IP RIP updates
- Extensive dial-up monitoring capabilities
- Automatic recognition of network topology and services
- Support for primary and secondary phone numbers (used for each modem interface)

2.2.1 Easy to Install and Configure

Routers are shipped ready for installation and configuration. Installation is described in **Chapters 3**, **4**, and **5**. You configure the Router with a dialogue that prompts you to enter the desired LAN, WAN and client parameters. To configure the Router, you can use either a PC with a terminal emulator like Windows Terminal or a serial terminal connected to the Router's console port, or use a host computer with telnet on the local Ethernet (TCP/IP), or use a host PC with RouterVu (included with the Router) on the local Ethernet (IPX).

2.2.2 Reduces Operating Costs

The Router supports idle timeouts and time quotas to reduce operating costs. Finally, the Router can restrict a client's access to the network, using the concept of a configurable client access shift. A client account can be restricted to client access during shift hours (IN), after hours (OUT), or 24 hours of the day.

2.2.3 Dial Suppression

Router link optimization (RLO) recognizes and minimizes unnecessary traffic. RLO has IPX and SPX filters to prevent dialing for and forwarding of, network traffic that doesn't originate from end-users. Although it is enabled by default, RLO can be manually enabled and disabled. See Appendix B, Line use.

Standard IP and IPX filters can also be used to suppress unnecessary dialing activities.

2.2.4 Prevents Unauthorized Network Access

The Router offers comprehensive security mechanisms to prevent unauthorized network access. The Router security operates at several levels:

- PPP link-level security (over the WAN link)
- IP, IPX, and SPX packet filtering
- passwords for ftp and telnet servers (IP)
- console login and password
- passwords for RouterVu logins (IPX)
- security callback to remote users (clients)
- client logins and passwords

2.2.5 Interoperable with RADIUS and SecurID Servers

The Router interoperates with RADIUS and SecurID authentication servers. RADIUS allows administrators to centrally store and manage names and passwords for IP sites with many dial-in routers and remote clients. SecurID requires remote clients to physically possess a SecurID metal card, in order to gain network access.

NOTE

SecurID and RADIUS technologies cannot be used at the same time on a Router.

2.2.6 PPP Link-Level Security

For PPP link-level security, the Router supports the Challenge Handshake Authentication Protocol (CHAP) and the Password Authentication Protocol (PAP). Both PAP and CHAP require password and node names for linking to prevent unauthorized users from gaining access through the Router. We strongly recommend using CHAP to provide security.

Along with PAP and CHAP, a new security CHAP (SCHAP) for Router clients supports security callback. A modem configured for client access attempts to negotiate CHAP, PAP, then SCHAP authentication.

2.2.7 IP and IPX Packet Filtering

The Router's extensive IP and IPX filtering allows specific hosts, networks, and services—mail, terminal, print, and file services—to be excluded from, or allowed access to, your network.

2.2.8 Predefined IP Packet Filters

If you will be using the Router to provide Internet access to your users, you have the option of installing a list of IP filters that are commonly used to protect networks from unauthorized access by Internet users. Refer to **Appendix B**.

2.2.9 Predefined IPX Packet Filters

You also have the option of installing a list of IPX filters that are commonly used to suppress dialing caused by unnecessary network traffic such as:

- Pings from NetWare servers
- SPX idle traffic
- NetBIOS name broadcasts between servers

- Any other IPX broadcasts.

Also refer to **Appendix B**.

2.2.10 Passwords for FTP and Telnet Servers

Passwords must be used to log in and transfer files to prevent unauthorized access.

2.2.11 Console Login

When a serial terminal (console) is in use, a login and password are required.

2.2.12 Passwords for RouterVu Logins (IPX)

Passwords must be used to log in to a Router with RouterVu.

2.2.13 Security Callback to Remote Users

A security callback feature can be enabled for any Async Router client. The client must be located at a specific phone number to access the Router. Security callback only works with Async Router clients.

Once a physical link is established, and before packet routing commences, the calling workstation presents a user name and password for authenticity. If the password is authentic, Router directs the client to end the phone session and enter into auto-answer mode, anticipating a response from the Router. Once the Router responds to the client, the process to determine authenticity ends. If a client attempts to establish a connection to a modem designated as a LAN-to-LAN line, the connection fails.

2.2.14 Client Passwords

The Router maintains a database supporting a maximum of 100 remote clients. Each record in this client database is associated with a single client. Each record of the database stores a client's name, password, connect quota (length of time each day a client is allowed to access the Router), idle timeout (length of time network inactivity is allowed to keep up the connection), security callback phone number, and shift access choice (access based on time of day).

2.2.15 Compression for Synchronous Interfaces

The Router provides compression for synchronous interfaces on the Sync Router, in both TCP/IP and IPX networks. For the sync0 interface, compression is enabled by default, but can be disabled using the **ppp** command. The Router implements compression using Stacker™ algorithms from Stat Electronics.

A synchronous PPP link can have two different compression methods on the same link, one in each direction. "No compression" counts as a compression method. Although theoretically multiple compression methods can be active across each direction of a PPP link, the Router supports only one method of compression per direction on a link.

Example:

For example, suppose your Router is linked to a remote router. There are two connections on the same links: one from your Router to the remote router, and one from the remote router to your Router.

When the Router establishes a link, it negotiates with the Router at the other end to select what type of compression will be used. During the negotiation, the Router will indicate a preference for the Stacker compression method.

2.3 Async Router AR-5 (LRA005A-R2) Features

The Async Router AR-5 has five internal V.34 modems. It connects LANs and clients at up to 28.Kbps over normal telephone lines.

2.4 Sync Router (LRS002A-R2) Features

The Sync Router works the same way as the Async Routers, except that it connects LANs over a variety of synchronous serial line types:

- Leased digital data service at 56 Kbps (North America) or 64 Kbps (Europe), i.e., a fixed line from one location to another, using an external Channel Service Unit/Data Service Unit (CSU/DSU).
- Switched 56 Kbps service, available in North America from either the local or the long-distance telephone companies, using an external CSU/DSU with dialing capability.
- ISDN basic rate service at 56 Kbps (referred to as voice, or 56 Kbps data), 64 Kbps (referred to as transparent data), or 128 Kbps (with bonding), using an external synchronous terminal adapter. If you want to use ISDN circuits, we recommend using the ISDN models that will be released in the future.
- Switched circuits, using synchronous V.34 modems (such as ZyXEL U1496+) over normal telephone lines. This type of circuit is not generally useful, since the standard compressing asynchronous modems used with the Router generally provide superior performance.

2.4.1 Automatic Fallback

If a leased synchronous line fails, the Router's built-in modem automatically supports fallback to the modem, for both IP and IPX routing.

2.4.2 Synchronous Router Interface

The Sync Router operates as an interface between synchronous routers from:

- Cisco
- Novell (MPR = Multi-Protocol Router)
- XYPLEX
- Wellfleet

Supported CSU/DSUs include (but are not limited to):

For digital data service:

- Our CSU/DSU MS (part number MT132A-R2)
- LarsE M5600 Multi-rate CSU A CSU/DSU with dual interface mode (V.35/EIA-232).
- Motorola/UDS DSS/MR (the Router works with the V.35 version only, of this CSU/DSU).
- Motorola/UDS DSS/V.32 A CSU/DSU which can use a dial-up V.32 connection as backup to a leased 56-Kbps line without using the modem port of the Router.

For switched-56 data service:

- Our CSU/DSU MS/DBU (SW56) (part number MT134A-R2): A CSU/DSU for 4-wire switched-56 service with AT-command or V.25 bis dialing support to RS-232 or V.35 DTE. This CSU/DSU can also be used for digital data service (DDS).

- Motorola/UDS SW56 II A CSU/DSU that can be used for DTR dialing on a Switched-56 network, or used for DDS.

For ISDN service:

- Black Box/EAZY part number IS280A.
- Adtran ISU 128: An ISDN/BRT TA (terminal adapter) that can create one 112 Kbps channel out of the two B channels on an ISDN BRI line.
- Motorola/UDS TA-220 and TA-220K: An ISDN/BRI TA that allows two different terminals to be active on different calls simultaneously. It also allows the two channels to be "bonded" into one 112 Kbps channel.

The Sync Router performs identically to the Async Router AR-P, unless specifically noted inn this document.

2.5 Async Client Kit

Each Async Router AR-5 is shipped with Async Client kits (also called RemoteOffice), and SmartRoute™ software that supports up to 100 clients. Each Async Client kit includes:

- Remote Office client software diskette (for PCs with DOS 3.3+ and Windows 3.1+)
- VLM software diskette (used by remote client software)

The remote client software package enables remote PCs, laptop computers and workstations to dial into a Router and access services on accessible LANs. Unlike LAN-to-LAN connections, which require a dedicated phone line between them, a remote client calls into any modem line on the Router (if it is configured for client operation). Remote client services can be offered inexpensively to many users, using the multiple built-in modem lines offered in the Async Router AR-5.

Remote client access requires a remote user to have an account on the Router. This client account is created by the system administrator. It has a user name, user password, and an optional security call-back number.

Refer to the *Reference Guide*, which begins on page 137, for more detailed information about managing client databases.

2.6 Operating Requirements

To configure or manage Routers, you need:

- a PC with a serial terminal emulator (such as Windows Terminal), or a serial terminal, or a PC on Ethernet (IPX), or a workstation with telnet on local Ethernet (IP)
- After initial configuration, remote management of Routers requires a PC with RouterVu (IPX networks) or a workstation with telnet (IP networks)

At an Async Router AR-P or AR-5 site, you need':

- a local Ethernet-based IP or IPX network
- a maximum of 5 phone lines
- one power outlet 110VAC to 250VAC

At a Sync Router site, you need:

- a local Ethernet-based IP or IPX network
- a leased line or switched digital line
- a CSU/DSU with a V.35 interface
- two power outlets (110 VAC to 250 VAC: one outlet for the Router and one for the CSU/DSU)

At the opposite end of the synchronous line, you need either:

- a second Router with synchronous interface, or
- another router with synchronous PPP support. Most router vendors offer synchronous PPP options that are compatible with Router's synchronous interface, but older models may use proprietary synchronous protocols that are not compatible.

For each remote client, you need:

- a PC or lap-top with DOS 3.3+ or Windows 3.1+
- a modem (and Async Client software)
- if TCP/IP remote client operation is required, a third-party package, such as Super-TCP, FTP Software PC/TCP, or others, is also required
- a phone line for the modem

3. Connect Cables

This chapter is the first of the installation chapters. It describes how to install Router cables.

Cabling varies depending upon your Router model. For cabling instructions, refer to the appropriate section:

- Async Router AR-P (LRA001A-R2): **Section 3.2**
- Async Router AR-5 (LRA005A-R2): **Section 3.3**
- Sync Router (LRS002A-R2): **Section 3.4**

After connecting cables, proceed to **Chapter 4** to install a PC, workstation, or serial terminal for configuring the Router.

3.1 Inventory

Included in the Router kit are the following:

- Router
- Power supply
- Power-supply cable
- V.35 cable, DB25, for Sync Router (LRS002A-R2) only
- Console cable (9-pin to 9-pin)
- Adapter cable (9-pin to 25-pin)
- Modem cable(s)
- This manual

3.2 Async Router AR-P Connections

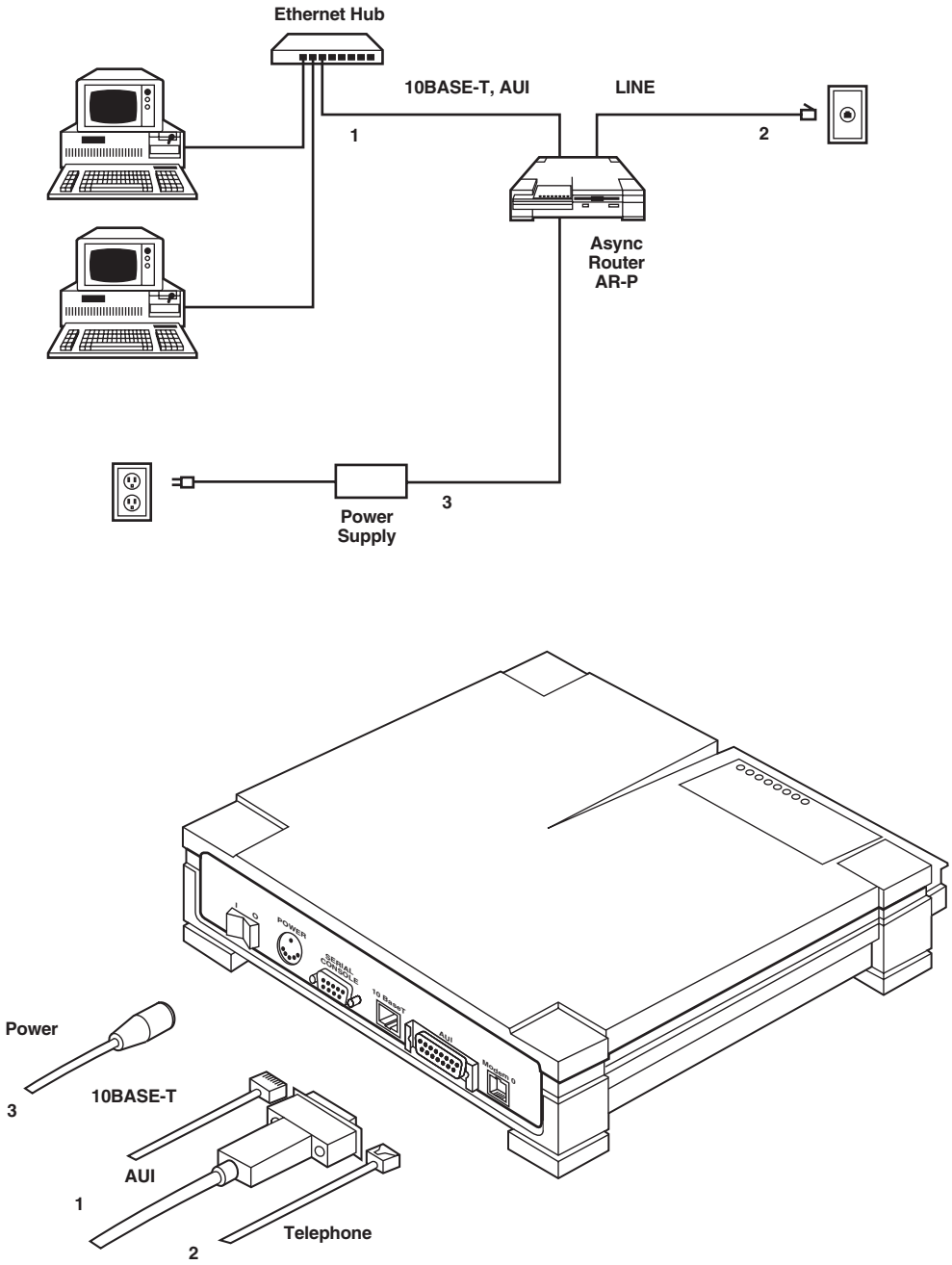

Figure 3-1. Async Router AR-P Connections.

Place the Router on a shelf or tabletop and follow these steps. The step numbers coincide with the cables in the illustration.

1. Using either a 10BASE-T or AUI cable, connect your Ethernet LAN to the appropriate connector.
2. Connect the LINE port (modem0) to the desired telephone line. This telephone line must be dedicated and cannot be used for any other purpose.
3. Connect the power supply with a power cord. Do not start the Router at this time.
4. Proceed to **Chapter 4**.

3.3 Async Router AR-5 Connections

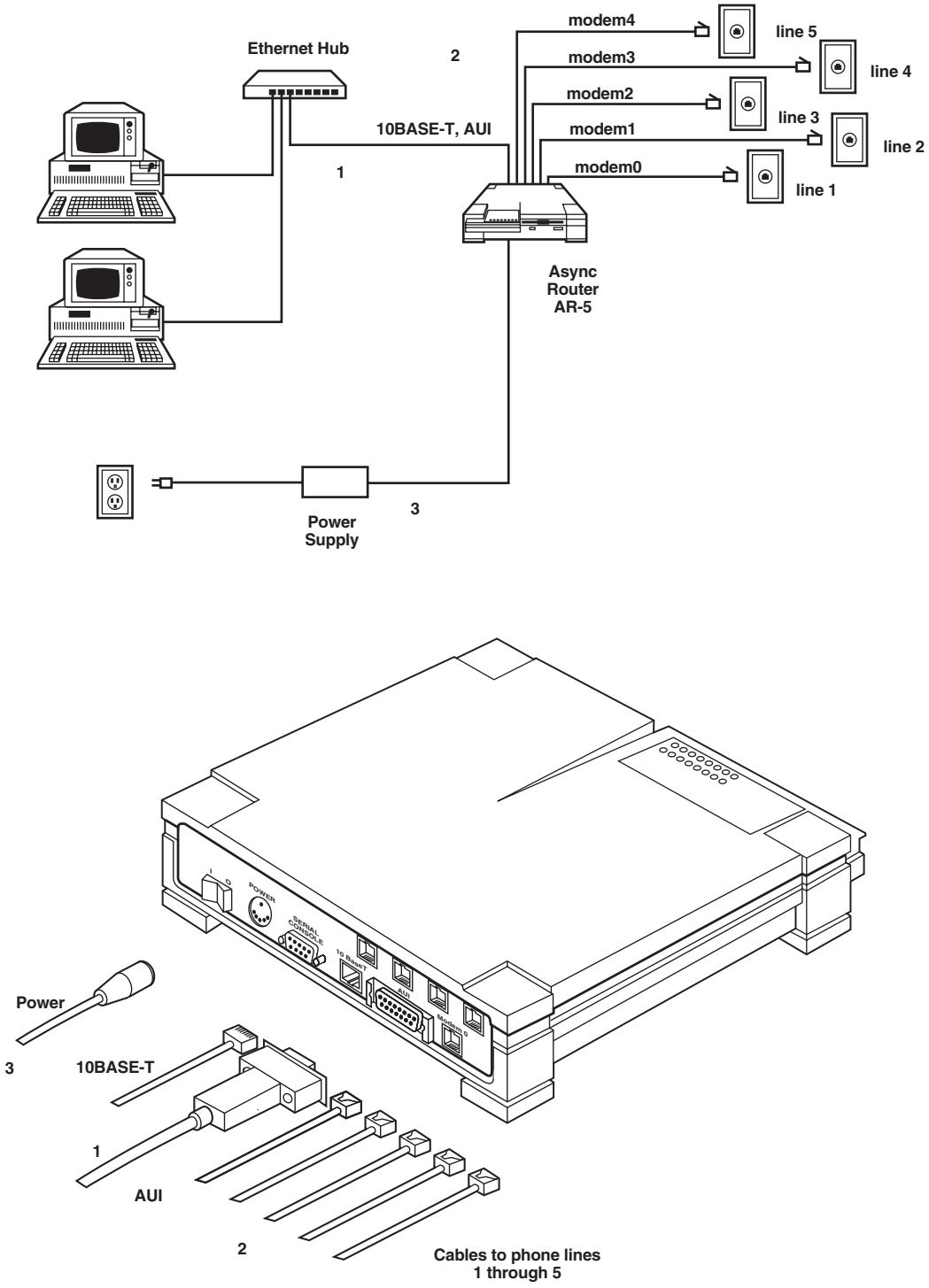

Figure 3-2. Async Router AR-5 Connections.

Place the Async Router AR-5 on a sturdy surface or in a rack, and follow these steps. The steps coincide with cables in the illustrations:

1. Using either a 10BASE-T or AUI cable, connect your Ethernet LAN to the appropriate (10BASE-T or AUI) connector.

2. Connect the available modem ports (modem0-modem4) to the desired telephone lines. These telephone lines must be dedicated and cannot be used for any other purpose

3. Connect the power supply with the power cord. Do not start the Router at this time.

4. Proceed to **Chapter 4**.

3.3 Sync Router Connections

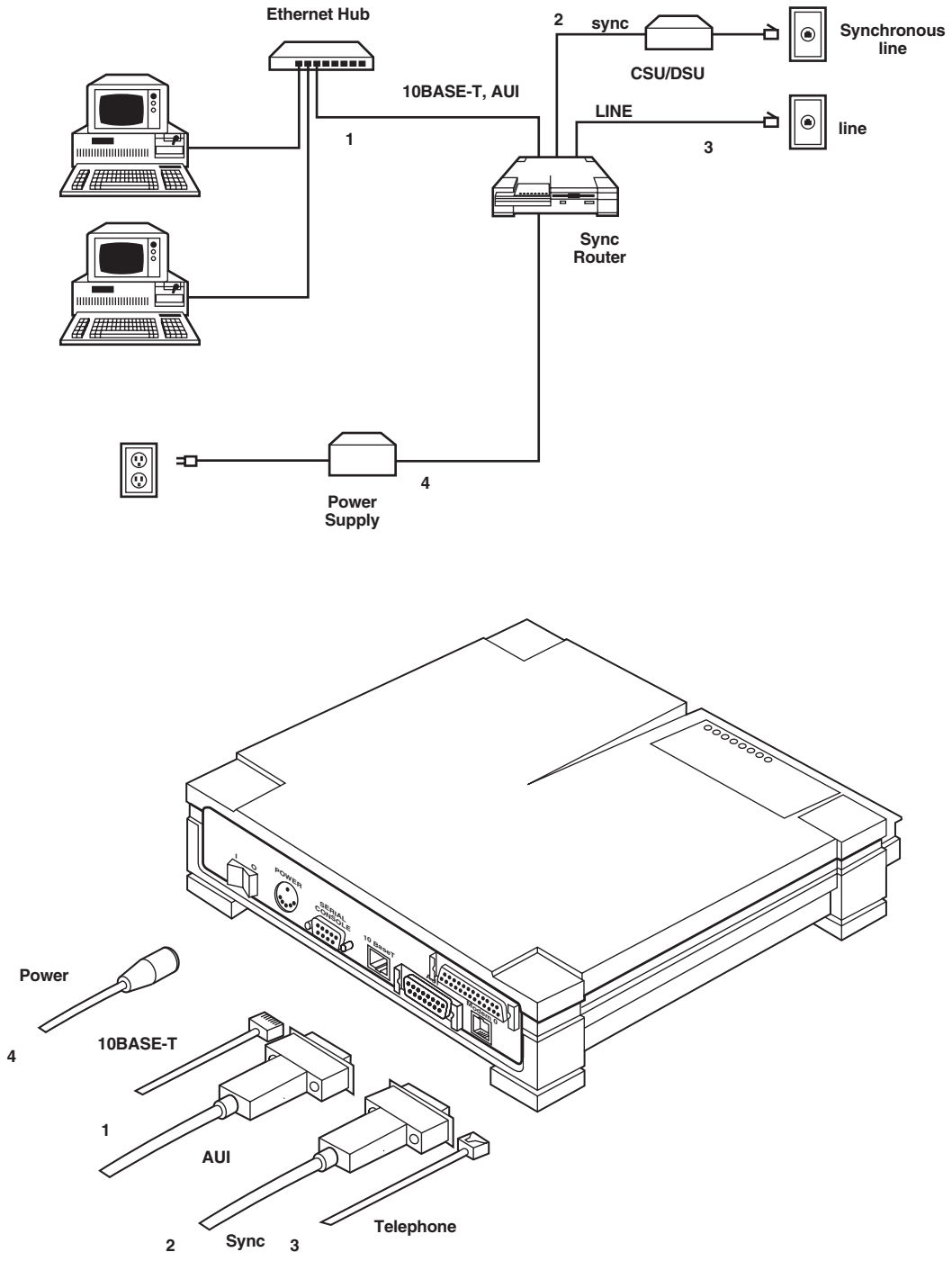

Figure 3-3. Sync Router Connections.

Place the Sync Router on a shelf or tabletop and follow the steps. The step numbers coincide with cables in the illustration.

1. Using either a 10BASE-T or AUI cable, connect your Ethernet LAN to the appropriate (I 0BASE-T or AUI) connector.
2. Locate the CSU/DSU you will be using. Use the cable provided (gray, 34-pin to 25-pin) to connect the Router's synchronous port to the V.35 port on the CSU/DSU. If you are using a CSU/DSU with a non-V.35 interface, you must use an adapter (V.35 to non-V.35). Connect the synchronous port of the CSU/DSU to the synchronous (digital) service line (RJ-45) provided by your telephone company.
3. Connect the modem0 (LINE) port to the desired telephone line. The modem can be used for fallback, or to connect to a modem at a site that is not at the same site as the synchronous link.
4. Connect the power supply with the power cord. Do not start the Router at this time.
5. Proceed to **Chapter 4**.

4. Connect Host

Once you connect Router cables as described in **Chapter 3**, either:

- connect a host (PC workstation or serial terminal) to install and configure software as described in **Chapters 4**, **5**, and **6**, or
- insert the previously configured boot diskette provided by your system administrator into the Router's diskette drive and proceed to **Chapter 6**.

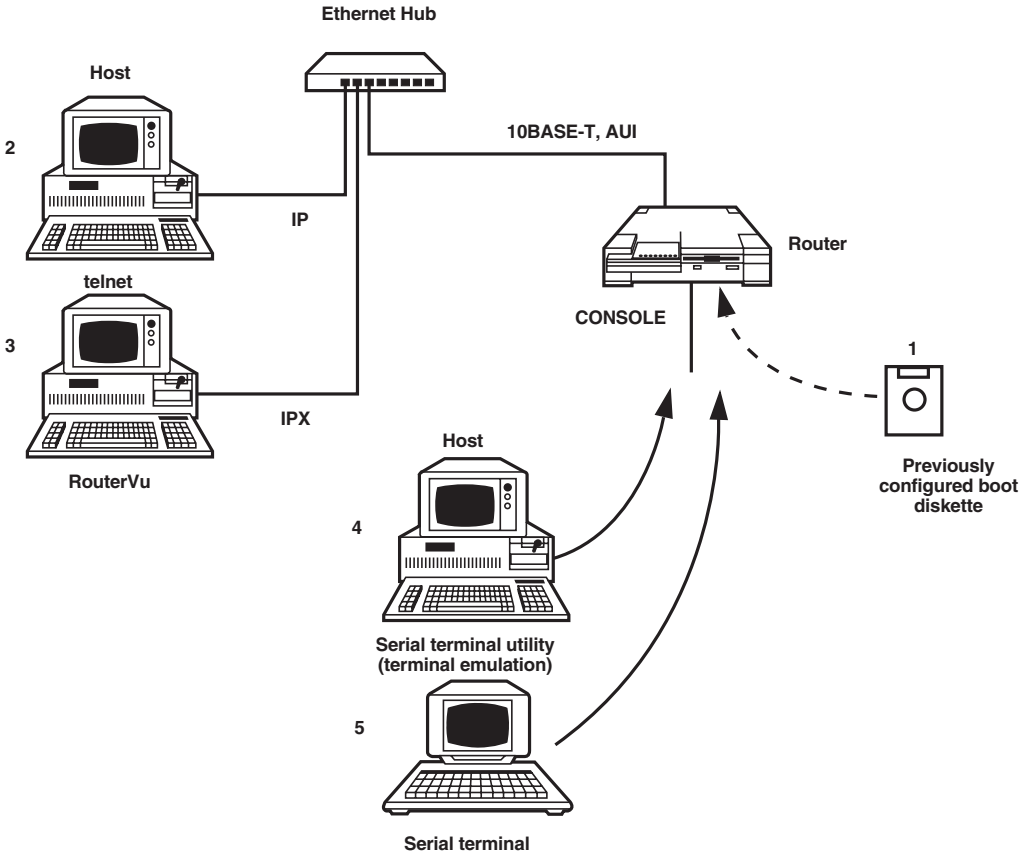

Figure 4-1. Five Methods to Configure the Router Software.

4.1 If you have a previously configured boot diskette...

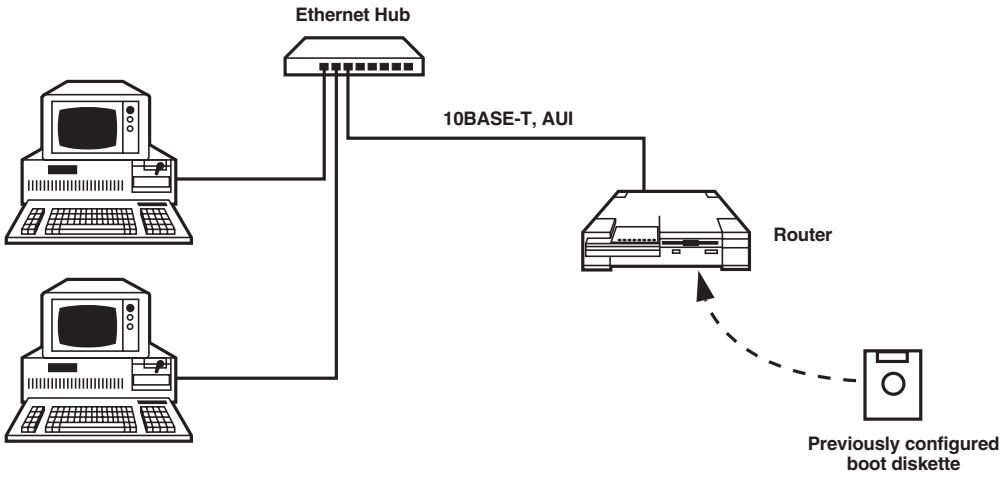

Figure 4-2. If you have a previously configured boot diskette...

If the Router boot diskette has not been previously configured, proceed to **Section 4.2**.

If your network administrator has prepared a previously configured boot diskette for you, simply insert the diskette into the Router's diskette drive and start the unit. The Router starts and uploads its configuration parameters from the boot diskette. Your Router is now fully operational. Do not perform the instructions in **Chapters 4** and **5**, and proceed directly to **Chapter 6** to test your installation.

Store the backup boot diskette for the Router in a secure place. The backup boot diskette also contains your Router's configuration, as configured by your network administrator.

NOTE

If you are the network administrator, you can preconfigure boot diskettes for the remote Router sites in advance, test them, and then mail them to the remote sites. This may be the easiest method to install and configure Routers. Make sure that you also create a backup boot diskette.

4.2 Select Host Connection Method

If you do not have a previously configured boot diskette, select a method to connect the host or serial terminal before installing the Router software as described in **Chapter 5**.

Table 4-1. Host Connection Methods.

Host	Required Host Applications	Required Host Location	Required Network Protocols
PC or workstation (2 of **Figure 4-1**)	*telnet* utility[1]	Must be on the same Ethernet as Router	IP
PC (3 of **Figure 4-1**)	*RouterVu* utility[1]	Must be on the same Ethernet as Router	IPX
PC (4 of **Figure 4-1**)	Serial terminal utility or terminal emulation	Must be connected to Router's console port	
Serial terminal (5 of **Figure 4-1**)	None	Must be connected to Router's console port	

[1]After the Router is initially installed, the system administrator can manage it remotely over the dialup link or from the local Ethernet LAN, using either:

- *telnet* for IP networks, or
- *RouterVu* for IPX networks.

The telnet utility allows you to access and configure Routers remotely over an IP network.

The RouterVu utility allows you to access and configure Routers remotely over an IPX network.

4.2.1 PC/Workstation Using Telnet Utility

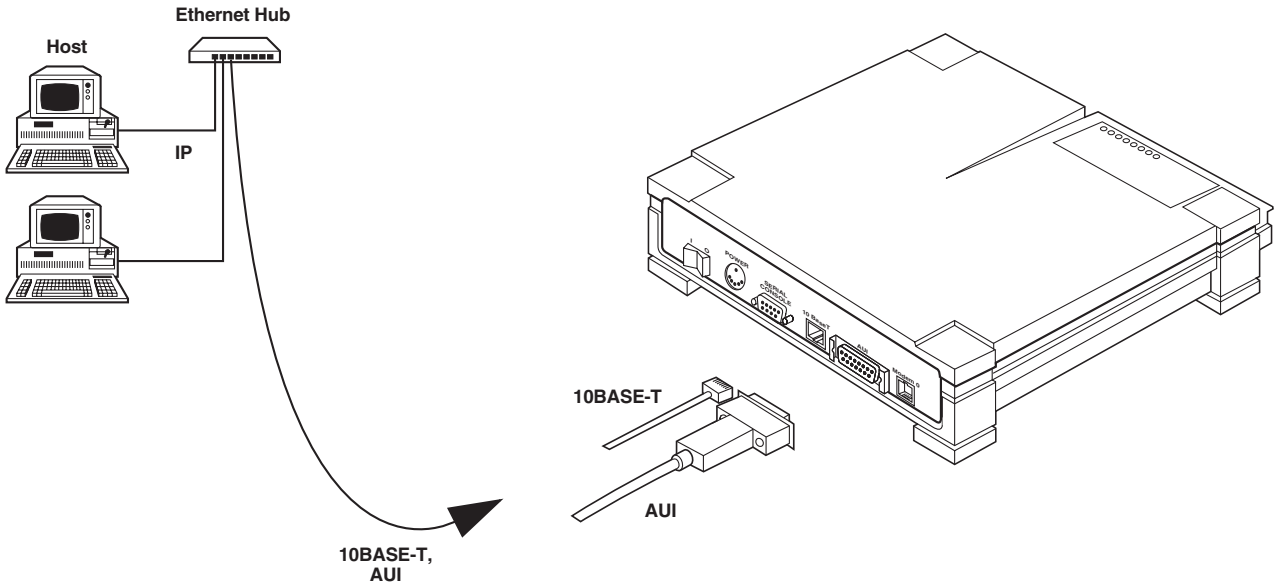

Figure 4-3. PC/Workstation Using Telnet Utility.

NOTE

This configuration requires the TCP/IP protocol on your LAN.

Before configuring the Router with a PC or workstation using a third-party vendor's *telnet* utility, you must use the *setaddr* utility to set an IP address on the Router's boot diskette.

setaddr requires a PC/workstation that can read and write 3.5-inch, 1.44-MB DOS diskettes; *telnet* does not require this capability.

When using telnet to install Router software, the computer using telnet must be a node on the same Ethernet LAN as the Router. You cannot use telnet to configure a Router until an IP address has been assigned, using *setaddr*.

Procedure

1. Start your DOS-based PC (one that can read and write 3.5-inch, 1.44-MB DOS diskettes).

2. Insert the Router boot diskette into the PC's diskette drive. We assume you're using the *a:* drive. If you're using the *b:* drive, substitute *b:* for *a:*.

3. Enter:

```
a:\stacker a:

a:setaddr <RETURN>
```

4. The *setaddr* program asks you whether you will be using IPX or IP addresses for telnet.

```
The Router must have an IP or IPX address before you can access it.
This program will set up the initial addresses for your Router.

For IPX addresses on a NetWare network enter 1
For IP addresses on a TCP/IP network enter 2
What kind of addresses will you use (1) or (2)?
```

   Enter 2, and press the RETURN key.

5. The *setaddr* program asks you for the IP address to be assigned to the Router:

```
The IP address of the Router must be set before you can
telnet in to the box.  This program will set up the initial
IP address for your Router.
Use d.d.d.d notation, (0 <= d <= 255 (decimal)).
Enter your IP address:
```

   Enter the Router's designated IP address, and press the RETURN key. Use dotted quad notation for your IP address: *d.d.d.d* where *d* is a decimal number greater than or equal to zero, and less than or equal to 255.

6. Now exit the Stacker utility and unmount the *a:* drive:

```
Initial configuration for your Router is now complete.
You must now take the boot disk, insert it into your Router
and power on the unit.  After the Router boots, you can
complete the configuration of the Router by using Telnet
(IP) or RouterVu (IPX) to access the box.

STACKER doubles your disk capacity!!
(type "EXIT" to unmount drive a:)

Enter

exit <RETURN>
```

7. Remove the Router boot diskette from the PC's diskette drive.

8. Using a 10BASE-T or AUI cable, connect the Router's Ethernet port to the local Ethernet LAN.

9. Insert the Router boot diskette into the Router's diskette drive.

10. Start the Router. Typically, it takes 2-3 minutes for the Router to start. This is normal. After the Router finishes starting, the diskette drive LED will turn off. Do not proceed until this LED turns off.

11. From another TCP/IP host on the network, *telnet* to the Router's IP address.

12. When you see a login prompt, type *root* and press the RETURN key. When prompted for the password, press the RETURN key.

13. Proceed to **Chapter 5**, and begin to install the software.

4.2.2 PC USING ROUTERVU UTILITY

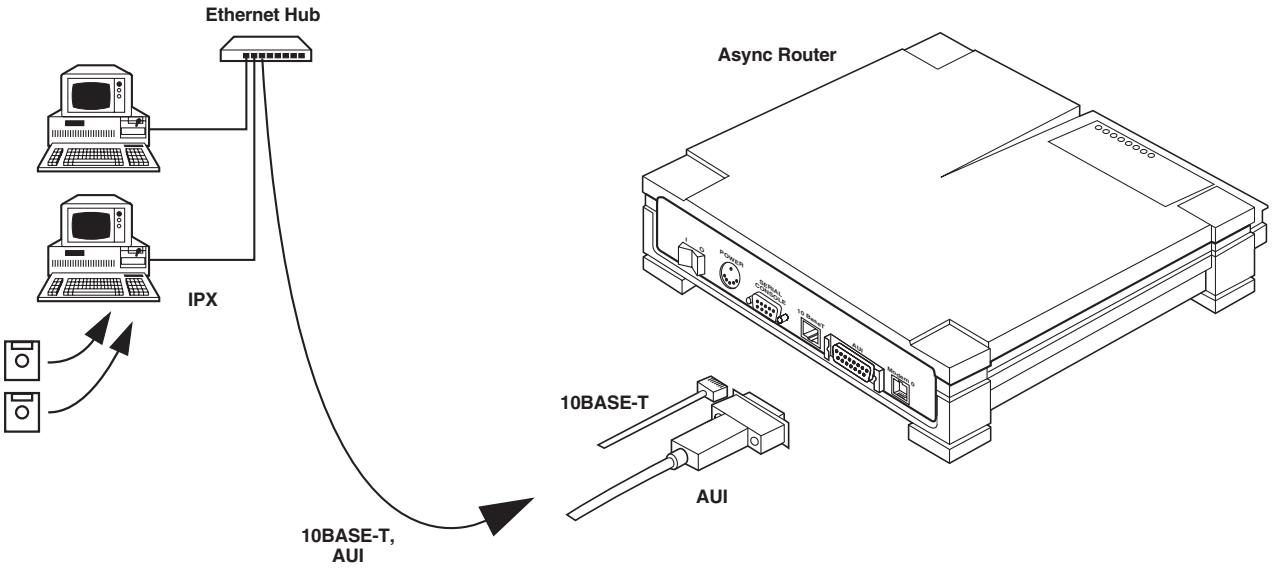

Figure 4-4. PC Using RouterVu Utility.

NOTE

This configuration requires NetWare IPX protocol on your LAN.

Before you can configure the Router with an IBM-compatible personal computer using the *RouterVu* utility (provided by us), you must use the *setaddr* utility to set an IPX network number and Ethernet frame type on the Router's boot diskette.

To use *setaddr* or *RouterVu*, your PC must read and write 3.5-inch, 1.44-MB DOS diskettes. When using RouterVu to configure the Router, your PC must reside on the same Ethernet LAN as the Router.

The PC operating with RouterVu should only be used by the system administrator when installing, maintaining or debugging the Router or its network connections.

The PC operating with RouterVu should not be used by users to gain access to local or remote networks. This method of access is illegal.

Procedure

1. Start your DOS-based PC.

2. Insert the Router boot diskette into the PC's diskette drive. We assume you're using the *a:* drive. If you're using the *b:* drive, substitute *b:* for *a:*.

3. Enter, for example:

```
a:\stacker a:    <RETURN>
a:setaddr        <RETURN>
```

4. The *setaddr* utility asks you whether you will be using IPX or IP addresses for telnet.

The Router must have an IP or IPX address before you can access it. This program will set up the initial addresses for your Router.

```
For IPX addresses on a NetWare network enter 1
For IP addresses on a TCP/IP network enter 2
What kind of addresses will you use (1) or (2) ?
```

Enter 1, and press the RETURN key.

5. *Setaddr* prompts you for the Router IPX network number.

```
  The IPX network number is the number assigned to the Ethernet
  segment attached to a NetWare server.  This information is
  in the AUTOEXEC.NCF file on the NetWare server that will be
  on the same Ethernet segment as the Router.

The number is in hexadecimal format.

What is the network number of the ethernet segment to which the Router will
be attached ?
```

Enter your designated IPX network number in hexadecimal format, and press the RETURN key.

6. *Setaddr* next prompts you for the frame type, used on the Ethernet to be connected to the Router.

```
For Frame Type 802.3             enter 1
For Frame Type Ethernet_II       enter 2
For Frame Type 802.2             enter 3
For Frame Type SNAP              enter 9

What is the Frame Type you are using ?
```

Enter the number designated for the desired frame type, and press the RETURN key.

7. *Setaddr* prompts you for the desired name of the Router.

```
A unique name is a name that is not used by any
NetWare file servers, print servers or Routers.
Enter a unique name for the Router:
```

Enter the desired name of the Router, and press the RETURN key.

8. Now exit the Stacker utility and unmount the *a:* drive:

```
Initial configuration for your Router is now complete. You
must now take the boot disk, insert it into your Router
and power on the unit. After the Router boots, you can
complete the configuration of the Router by using Telnet
(IP) or RouterVu (IPX) to access the box.

STACKER doubles your disk capacity!!
(type 'EXIT' to unmount drive a:)
```

Enter

```
exit <RETURN>
```

9. Remove the Router boot diskette from the PC's diskette drive.

10. Using a 10BASE-T or AUI cable, connect the Router's Ethernet port to the local Ethernet LAN.

11. Insert the Router boot diskette into the Router's diskette drive.

12. Start the Router. Typically it takes 2-3 minutes to load the contents of the boot diskette. This is normal. After the Router finishes starting, the diskette drive LED will turn off. Do not proceed until this LED turns off.

13. From a PC on the Ethernet, insert the RouterVu diskette into the PC, and enter:

```
a: \ routervu name
```

where the *name* is associated with the Router that you want to configure, and the floppy drive is the *a:* drive. Previously in step 7, you specified *name* using *setaddr*.

14. When you see a login prompt, type *root* and press the RETURN key. When prompted for the password, press the RETURN key again.

15. Proceed to **Chapter 5**, and begin installing the software.

4.2.3 PC Using Serial Terminal Utility

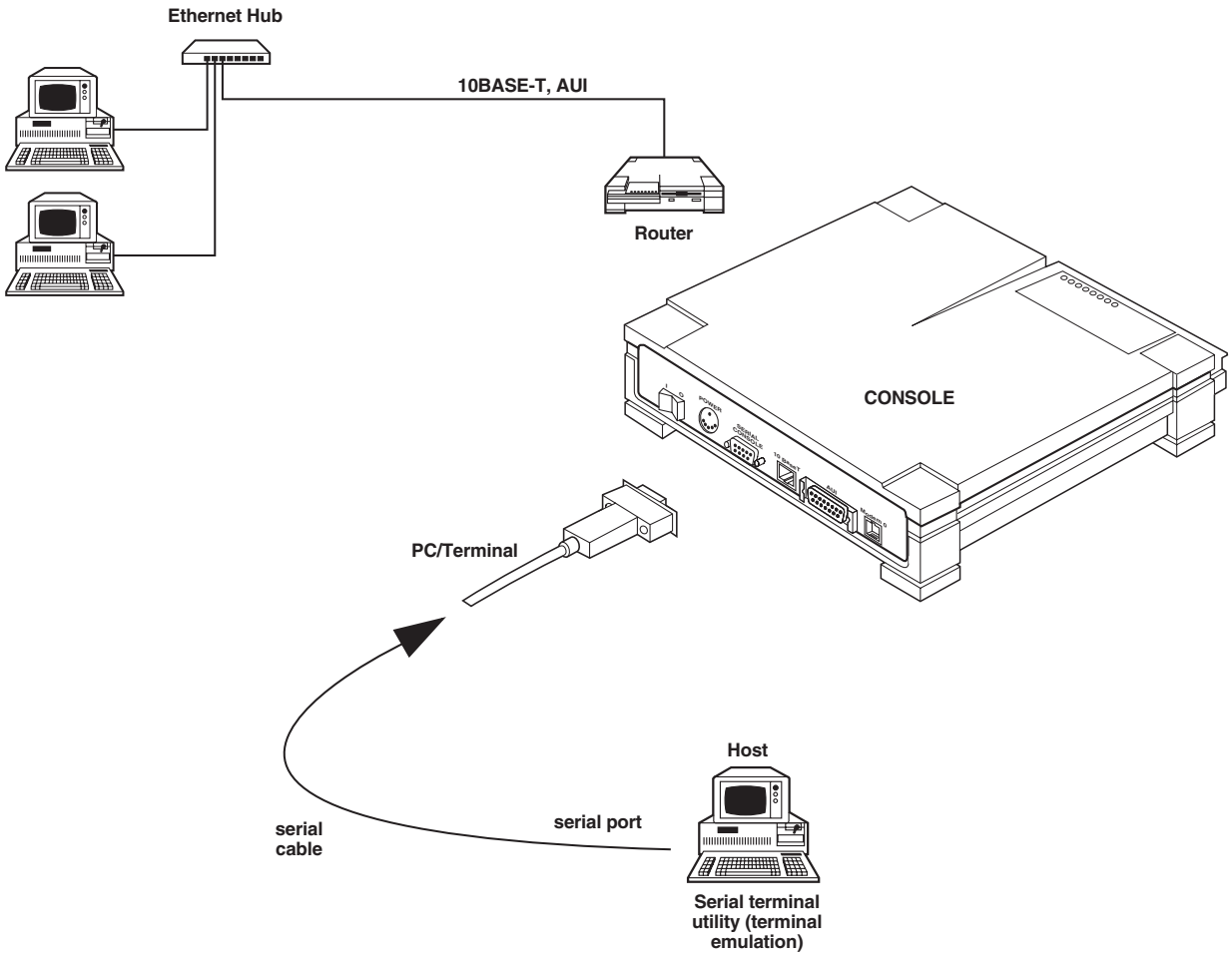

Figure 4-5. PC Using Serial Terminal Utility.

You can configure the Router by using a PC operating with a serial terminal emulator such as Windows Terminal.

The PC emulating the terminal should only be used by the system administrator when installing, maintaining or debugging the Router or its network connections.

The PC emulating the terminal should not be used by users to gain access to local or remote networks. This method of access is illegal.

1. Using the serial cable provided, connect a PC's serial port to the console port of the Router. Set the serial terminal utility to 9600 bps, no parity, 8 data bits, and 1 stop bit.

2. Insert the Router boot diskette in the Router diskette drive.

3. Start the Router.

   Typically it takes 2-3 minutes to load the contents of the boot diskette. This is normal. After the Router finishes starting, the diskette-drive LED will turn off. Do not proceed until this LED turns off.

4. When you see a login prompt, type *root* and press the RETURN key. When prompted for the password. press the RETURN key.

5. Proceed to **Chapter 5**, and begin the software installation process.

4.2.4 Serial Terminal

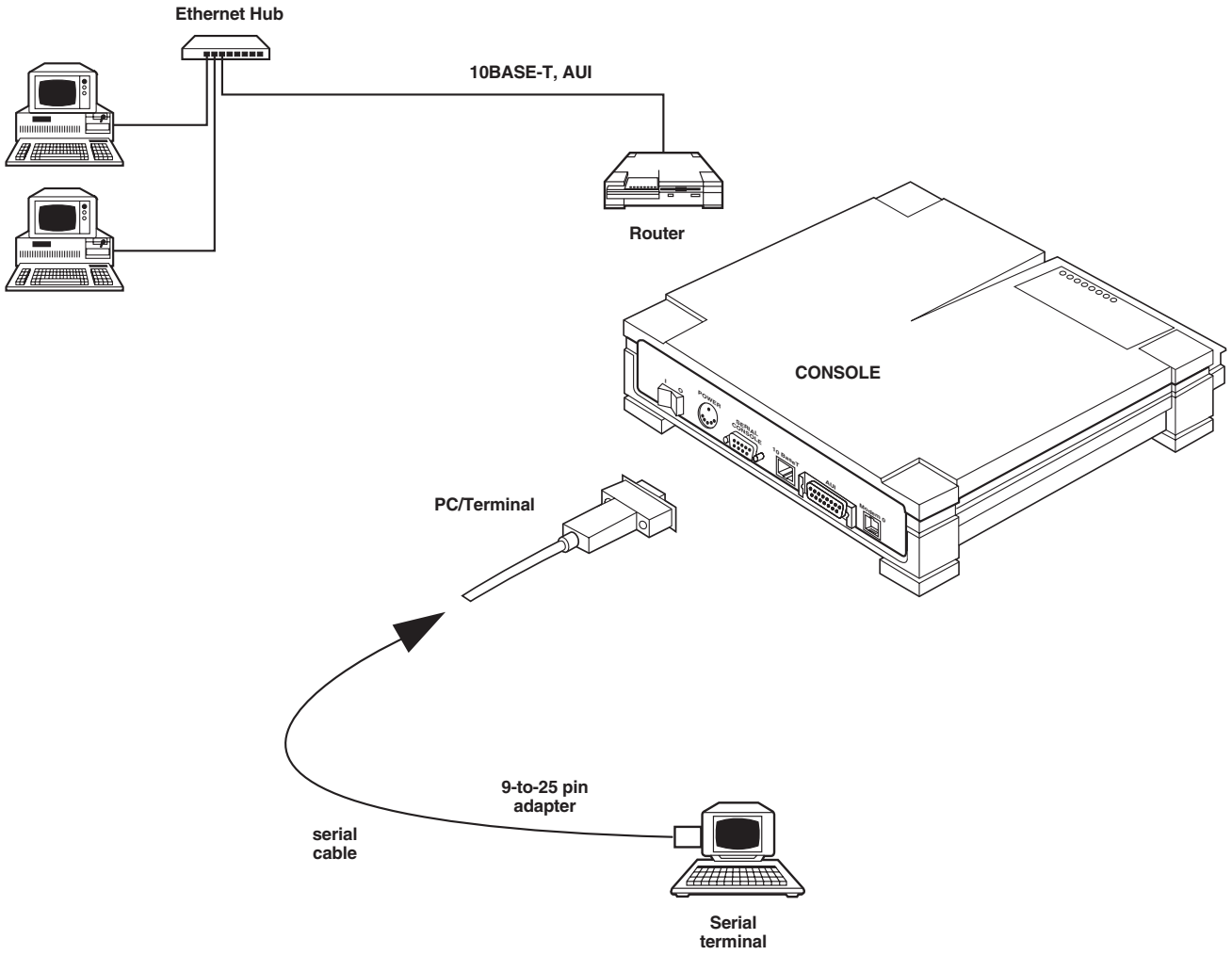

Figure 4-6. Serial Terminal.

You can configure the Router by a serial terminal, connected to the Router console port.

The serial terminal should only be used by the system administrator when installing, maintaining, or debugging the Router or its network connections.

The serial terminal should not be used by users to gain access to local or remote networks. This method of access is illegal.

1. Using the serial cable provided, connect a serial terminal to the console port of the Router. If necessary, use the adapter provided with the console cable. Set the serial terminal to 9600 bps, no parity, 8 data bits, and 1 stop bit.
2. Insert the boot diskette into Router's diskette drive.
3. Start the Router. Typically it takes 2-3 minutes to load the contents of the boot diskette. This is normal. After the Router finishes starting, the diskette drive LED will turn off. Do not proceed until this LED turns off.
4. When you see a login prompt, type *root* and press the RETURN key. When prompted for the password, press the RETURN key.
5. Proceed to **Chapter 5** to install the software.

5. Install Software

Once you have installed the unit with its cables (**Chapter 3**) and implemented a means for installing the software (**Chapter 4**), your Router is ready to be configured to operate on a TCP/IP and/or IPX network.

The software installation essentially prompts you to define the LAN, WAN, and client parameters desired for your Router's configuration.

- LAN parameters—define the LAN parameters for the Router you are installing (the local Router).
- WAN parameters—define the parameters for the modem/sync interfaces of the local Router.
- Client parameters—define the client parameters for the remote clients.

Before configuring your Router, complete the Installation Reference in **Appendix F**. You will need much of this information to successfully install the Router, and after installation, you will have a record of what you have done. Before installing the Router, we also recommend that you read **Appendix A**.

5.1 Installation Summary

- Working with your network administrator, complete the *Installation Reference* in **Appendix F**.
- Preview one of the software installation examples.
- Start the software installation process.
- As prompted by the Router, enter the LAN, WAN (modem, sync) and client parameters as recorded in your *Installation Reference* in **Appendix F**. Also refer to parameter explanations and examples at the end of this chapter, organized by parameter type.
- After finishing the installation process and saving the configuration, proceed to **Chapter 6**.

5.2 Installation Procedure

1. Select and preview the installation example (screen listing) based upon your Router model: Async Router AR-P or AR-5, or Sync Router. The installation examples include both TCP/IP and IPX (NetWare) protocols. If your installation requires only one of these protocols, some prompts will not appear.
2. Start the installation from your serial port terminal, PC emulator program, telnet, or RouterVu session.

   Note that a previously configured Router will not automatically display configuration parameters for you to select. To change a previously configured Router, issue the *config modify* command from the prompt. You will now be prompted through the entire configuration process.
3. Refer to the parameter descriptions at the end of this chapter when you have questions regarding any of the parameters.
4. Any time during configuration, press the ESC key to stop the process. As a result, the Router returns to the beginning of the configuration process and will do so until you explicitly save the configuration.
5. Proceed to **Chapter 6** to test your Router installation.

NOTE

For LAN-to-LAN operation, configure your local and remote NetWare LANs with unique network numbers before configuring and operating the Router. This includes all network numbers for all frame types. These numbers are set in the AUTOEXECNCF files of your NetWare file servers, with the "BIND IPX TO lan_driver NET= net_number" statements. Before proceeding with your Router software installation, make sure that your local and remote IPX LANs have unique network numbers.

For User-to-LAN operation, each remote user (client) must also have a unique NetWare network number. By default, the Router automatically assigns a unique network number to each client. If you want the client to define the IPX network number used, set the IPX network number of the Router's modem to zero using the "ifconfig" command. If the client and the Router have different assigned IPX network numbers, then the Router will use the higher network number of the two.

5.3 Installation Examples

5.3.1 Async Router AR-P, Async Router AR-5

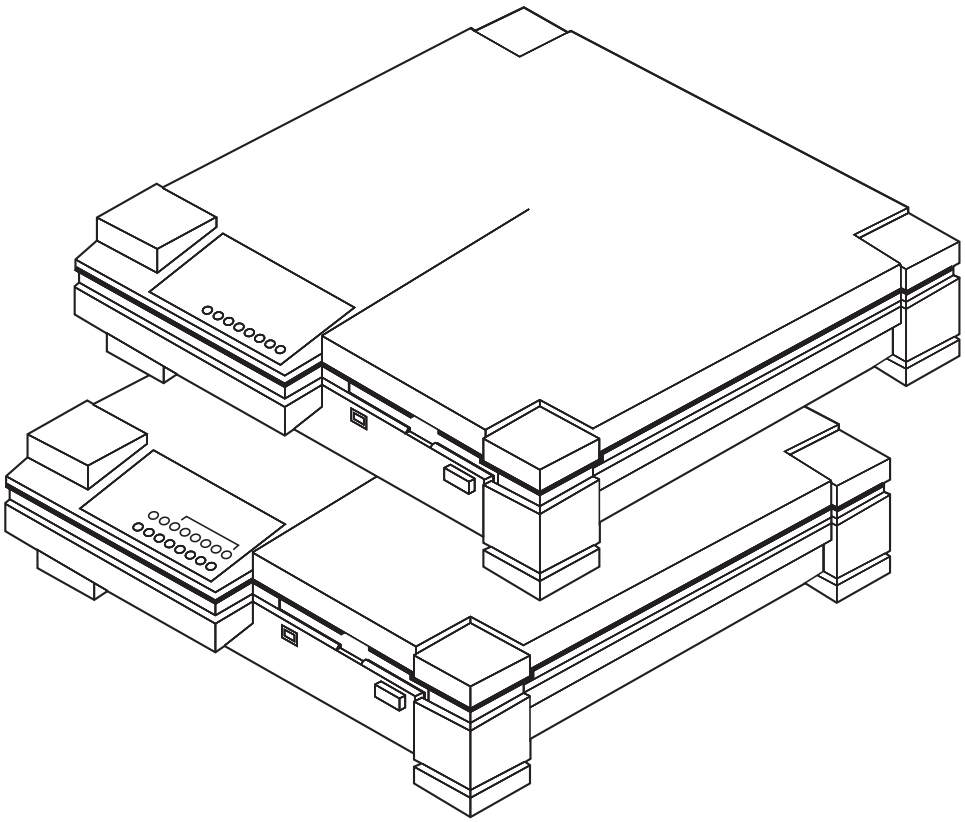

Figure 5-1. Async Router AR-P, Async Router AR-5.

Define LAN Parameters:

```
login:  root
Password:

Welcome root to the Router (4.0)

The following configuration information must be
supplied before the Router can become operational.
Default values for each parameter are shown in
parentheses.

Press <Esc> at any prompt to cancel this script and
delete the configuration.

This system:
Name (Router):  paris
Root password ():
Retype password:
Link password:
Retype password:
Date/time in yymmddhhmm[.ss] format (9408291604.01):

Enable IPX routing (y): y
Enable IP routing (y): y
```

Define LAN parameters for local Router:

```
Ethernet:
IPX:
Ethernet_802.3:
Network (): 1
Ethernet_II:
Network (): 2
802.2:
Network (): 3
SNAP:
Network (): 4

IP:
address (): 131.143.19.72
subnet mask (255.255.0.0):  255.255.252.0

Syslog IP address ():  131.143.19.72
Do you have domain name servers? (n): y
Domain name servers:
IP address (): 131.143.16.1
IP address ():
Domain suffix (com): rns.com
```

Define Modem Parameters:

```
Do you want to configure and use modem0 now (y): y

What type of system are you connecting this modem to?

1) Async Router AR-P, AR-5, or Sync Router
2) Async Client or other client
3) Livingston Portmaster
4) Telebit NetBlazer or PN
5) Other LAN to LAN

Please enter the number of your choice (1): 1
```

Define modem0 parameters:

```
  Remote site information:
  Phone # ( ):  805-555-1212
  Maximum minutes of phone usage per day (1440):
  Name (remote0):  ventura
  Link password ( ):
  Retype password:
  IP address ( ): 131.143.23.25
  IP subnet mask (255.255.0.0):  255.255.252.0
  Branch offices usually have a default route pointing to
  the home office
  You have no default route
  Add a default route to modem0 (y): y
```

Define modem1 (if present)

```
Do you want to configure and use modem1 now (y): y

What type of system are you connecting this modem to?

  1) Async Router AR-P, AR-5, or Sync Router
  2) Async Client or other client
  3) Livingston Portmaster
  4) Telebit NetBlazer or PN
  5) Other LAN to LAN

Please enter the number of your choice (1):  2

Remote site information:
  Remote Client IP address, optional ( ):  143.143.33.33

Do you want to configure and use modem2 now (y):  y

What type of system are you connecting this modem to?

  1) Async Router AR-P, AR-5, or Sync Router
  2) Async Client or other client
  3) Livingston Portmaster
  4) Telebit NetBlazer or PN
  5) Other LAN to LAN
```

```
Please enter the number of your choice (1):  3
```

Define modem2 (if present)

```
Remote site information:
  Phone # ( ): 213-555-1212
  Maximum minutes of phone usage per day (1440):
  Name (remote2):  LAoffice
  Authentication (N)one, (P)AP, or (C)HAP (C):  P
  Link password ( ):
  Retype password:
  IP address ( ):  132.222.23.12
  IP subnet mask (255.255.0.0):
  Branch offices usually have a default route pointing to
  the home office
  You have no default route
  Add a default route to modem0 (y):  n
  Login name ( ): frank
  Login password ( ):
  Retype password:

Do you want to configure and use modem3 now (y):  y

What type of system are you connecting this modem to?

  1) Async Router AR-P, AR-5, or Sync Router
  2) Async Client or other client
  3) Livingston Portmaster
  4) Telebit NetBlazer or PN
  5) Other LAN to LAN
```

Define modem3 (if present)

```
Please enter the number of your choice (1):  4

Remote site information:
  Phone # ( ):  714-555-1212
  Maximum minutes of phone usage per day (1440):
  Name (remote3):  orange
  Authentication (N)one, (P)AP, or (C)HAP (C):  c
  Link password ( ):
  Retype password:
  IP address ( ):  132.132.12.80
  IP subnet mask (255.255.0.0):
  Branch offices usually have a default route pointing to
  the home office
  You have no default route
  Add a default route to modem0 (y):  n
  Login name ( ):  linda
  Login password ( ):
  Retype password:
```

Define modem4 (if present)

```
Do you want to configure and use modem4 now (y):  y

What type of system are you connecting this modem to?

  1) Async Router AR-P, AR-5, or Sync Router
  2) Async Client or other client
  3) Livingston Portmaster
  4) Telebit NetBlazer or PN
  5) Other LAN to LAN

Please enter the number of your choice (1):  5

Remote site information:
  Phone # ( ):  213-345-2498
  Maximum minutes of phone usage per day (1440):
  Name (remote4):  marina
  Authentication (N)one, (P)AP, or (C)HAP (C):  n
  IP address ( ):  205.322  200.76.30
  IP subnet mask (255.255.255.0):
  Branch offices usually have a default route pointing to
  the home office
  You have no default route
  Add a default route to modem0 (y):  n
  Login name ( ):  bobby
  Login password ( ):
  Retype password:
  Script name (\other.dcf):  mroutr.dcf
```

Define client access shift for this Router

```
  Enter the client access shift time in
  hhmmhhmmMTWRFSU format (00002400MTWRFSU):  070019002300400mtwrfs

  Do you want to save this configuration:  y
  wait.....
  saving.....
  Add clients to remote client database? (y):  y
  Use express setup? Express setup assumes
  default values for the time, and quota
  and sets the callback number to <none>. (y):  n
  Client name ( ): jones
  Client password ( ):
  Reenter password:
  Enable client (y):  y
  Access time (0000 2400 MTWRFSU) - In, Out, Both (B):
  Time quota (1440 minutes)L
  Idle time (240 seconds):
  Callback phone number ( ): 19-1-210-555-2333
```

Define clients

```
Add another client? (y):  y
Client name ( ):  johnson
Client password ( ):
Reenter password:
Enable client (y):  n
Access time (0000 2400 MTWRFSU) - In, Out, Both (B):
Time quota (1440 minutes):
Idle time (240 seconds):
Callback phone number ( ):  19-1-210-555-1333

Add another client? (y):  n

saving...
(tcp/ip)paris>
```

5.3.2 SYNC ROUTER

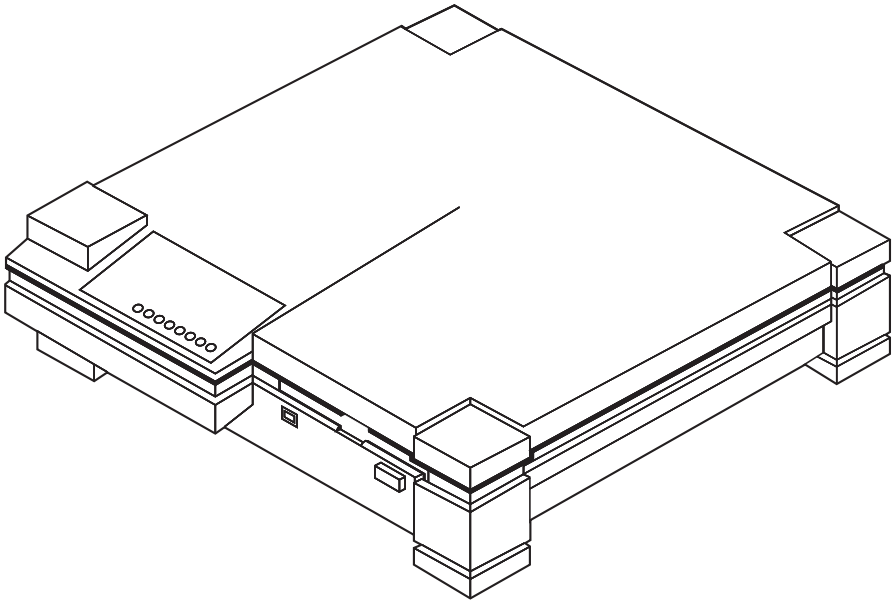

Figure 5-2. Sync Router.

Define LAN parameters

```
login:  root
Password:

Welcome root to the Router (4.0)

The following configuration information must be
supplied before the Router can become operational.
Default values for each parameter are shown in
parentheses.

Press <ESC> at any prompt to cancel this script and
delete the configuration.

This system:
Name (Router):  kansas
Root password ( ):
Retype password:
Link password ( ):
Date/time in yymmddhhmm[.ss] format (940910942.36):
```

```
  Enable IPX routing (y):  y
  Enable IP routing (y):  y
```

Define LAN parameters for local Router:

```
Ethernet:
  IPX:
  Ethernet_802.3:
  Network ( ):  1
  Ethernet_II:
  Network ( ):  2
  802.2:
  Network ( ):  3
  SNAP:
  Network ( ):  4

IP:
  address ( ):  128.129.100.1
  subnet mask (255.255.0.0):  255.255.255.0

  Syslog IP address ( ):
  Do you have domain name servers? (n):  y
  Domain name servers:
  IP address ( ):  128.129.100.50
  IP address ( ):
  Domain suffix (com):  widgets.com
```

Define Sync/Modem Parameters:

```
  Do you want to configure and use sync0 now (y):  y
  Is this a leased line (y):  y

Remote site information:
  Name (sremote0):  malibu
  Authentication (N)one, (P)AP, or (C)HAP (N):  P
  Link password ( ):
  Retype password:
  IP address ( ):  128.129.90.90
  IP subnet mask (255.255.0.0)
  Branch offices usually have a default route pointing to
  the home office
  You have no default route
  Add a default route to sync0 (y):  y

Do you want to configure and use modem0 now (y):  y
  Is modem0 a fallback line for sync0 (y):  n

What type of system are you connecting this modem to?

  1) Sync Router
  2) Async Client or other client
  3) Livingston Portmaster
  4) Telebit NetBlazer or PN
  5) Other LAN to LAN

Please enter the number of your choice (1):  1
```

```
Remote site information:
  Phone # ( ):  1-210-555-1212
  Name (remote0):  georgia
  Link password ( ):
  Retype password:
  IP address ( ):  128.129.13.1
  IP subnet mask (255.255.0.0):
  Branch offices usually have a default route pointing to
  the home office
  You have no default route
  Add a default route to modem0 (y):  n

Do you want to save this configuration:  y
  wait...
  saving...

Add clients to remote client database?  (y):  y
  Use express setup?  Express setup assumes
  default values for the time, and quota
  and sets the callback number to <none>. (y):  y
  Client name ( ):  jones
  Client password ( ):
  Reenter password:
  Enable client (y):  n

Add another client? (y):  n

  saving...
  (tcp/ip)kansas>
```

5.4 Parameters

Name and Password Syntaxes

All types of **names**

- have 1 to 31 alphanumeric characters
- do not contain periods "."
- start with a letter
- are case-sensitive

All types of **passwords** are **6** to **15** alphanumeric characters, and are **case-sensitive**.

During initial configuration, current values of parameters are shown in parentheses ( ) on the console display.

5.4.1 LAN PARAMETERS

Record all parameters in the *Installation Reference* (see **Appendix F**), and store the it in a secure place.

- *Name*—Enter the system name of the Router you are configuring. The system name may contain a 1 to 31 characters, but must not contain periods. Do not use the default name of "Router." Each Router must have a unique system name. When referencing this Router on other systems, use the system name exactly as entered on your Router, for their remote system name.

  Commonly the system name is a location or description that distinguishes the Router from other nodes in your network.The Router uses its system name when establishing a WAN connection. The system name is used by all other systems that are connected to this Router.

- *Root password*—Enter the password required to log in to the Router as a root user. A unique password is required. Null passwords are not secure, and are not accepted. The root password must have 6 to 15 alphanumeric characters, and is case-sensitive.

  The system administrator uses the root password to log into this Router through a *telnet* or *RouterVu* session, or by *pp*, or from a serial terminal.

- *Link password*—Enter the password that remote Routers (or other systems) must use to access this Router. The link password must be entered twice and will not be displayed on the screen. The link password must be identical to the remote system's link password on all other Routers (or other systems).

- *Date/time*—Enter the date and time in the format yymmddhhmm[.ss], where *yy* is the last two digits of the year, *mm* is the month number, *dd* is the day (with leading zero), *hh* is the hour (24 hour format), and *mm* is the minute. The seconds parameter *.ss* is optional. The default shown is the system clock, which is preset at the factory.

- *Enable IPX routing*?—Enter yes, if you are using Novell® NetWare on your LANs.

- *Enable IP routing*?—Enter yes, if you are using TCP/IP on your LANs.

- *IPX: network numbers ()*—(If IPX protocol is used) Enter the IPX (NetWare) network numbers (in hexadecimal) for each Ethernet frame type activated on the local Ethernet. You must enter an IPX network number for at least one frame type, although it is not necessary to enter an IPX network number for each frame type. Only enter network numbers for the frame types that you are using on your local Ethernet. If you are not using a frame type, enter a "0" for the network number for that frame type.

  These IPX network numbers are the same as the network numbers configured on your NetWare servers.

  Before configuring and operating the Router, configure your local and remote NetWare LANs with unique (different) IPX network numbers. This includes all IPX network numbers for all frame types. These numbers are set in the AUTOEXEC.NCF files of your NetWare file servers, with the "BIND IPX TO lan_driver NET= net number" statements.

- *IP address (If TCP/IP protocol is used...)*—Enter the IP address for the local Router. Use dotted-quad notation for your IP address: *d.d.d.d*, where *d* is a decimal number. A 32-bit IP address consists of four 8-bit decimal numbers separated by periods, for example, 128.66.16.100. Do not use any other format for your IP address.

- *IP subnet mask*—Enter the subnet mask desired, in decimal dotted-quad notation. The subnet mask defaults to all ones for the network portion and all zeroes for the host portion, which corresponds to the class of IP address entered. Typical subnet masks are specified in **Table 5-1**, in decimal dotted-quad notation and bits notation.

  Bits notation represents the number of contiguous high-order bits with a value of one that define the subnet portion of an IP address.

Table 5-1. IP Subnet Mask Default Values by Class.

IP Address	Class	Subnet Mask	Bits
10.0.0.1	A	255.0.0.0	8
128.66.2.1	B	255.255.0.0	16
192.0.2.1	C	255.255.255.0	24

- *Syslog IP address*—Enter the IP address of a remote host capable of logging *syslog* messages. The Syslog IP address is optional. For more information, refer to the syslog command in the *Reference Guide*, which starts on page 137, and the system administration manual for your syslog host.

- *Domain name server (DNS) IP addresses*—Enter the IP addresses of the preferred domain name servers on your network. Use dotted-quad notation: *d.d.d.d*, where *d* is a decimal number.

  Domain name servers allow users to specify network nodes by name, instead of by IP address. If you configure the Router to use a domain name server on your network, you can use a host name instead of the IP address in many of the Router commands.

  Do not specify the address of a domain name server that can only be reached using a WAN interface (modem or sync). If you do, it will cause the Router to dial the phone on all name lookups, and will increase your phone costs unnecessarily.

- *Domain suffix*—Enter the domain name suffix desired. The domain name suffix is the last group of letters separated by a period (for example, *ms.com*). Do not include a leading period in the domain suffix you enter. This domain suffix is automatically appended to a hostname entered with a Router command.

  To terminate the list of servers press RETURN at the IP address (): prompt. If you do not use a domain suffix, just press RETURN.

  Domain names of similar types of organizations on the Internet usually use a common suffix. Typical suffices and organization types are shown in **Table 5-2**.

5.4.2 Choose Method of Client Authentication

How do you want to authenticate users connecting to a Router?

Enter the client authentication method desired. The client authentication method only applies to dial-in clients (client to router), and does not apply to LAN-to-LAN services (router to router). If you already have a configured SecurID or RADIUS server on your network, you can choose either to use it (choose 2 or 3), or to use the Router (to store names and passwords; choose 1).

NOTE

To use a SecurID or RADIUS server, your network must use the TCP/IP protocols.

Table 5-2. Domain Name Suffix Types.

Suffix	Organization Type
com	Commercial organizations
edu	Educational institutions
gov	Government facilities
mil	Military groups
net	Major network support centers
org	Other organizations
(country code)	Country other than USA

If you want to use a SecurID server...

You must have a **SecurID card** that is configured with a **username** on the SecurID server. At the end of the Router's configuration script, you will be prompted through a process where you will be validated by the SecurID server for the first time. You will need your SecurID card and its associated username at that time. During normal operations, a SecurID user must provide a valid username (defined on the SecurID server), a numeric code shown on the card's LCD display, and an optional PIN number defined by the user.

If you want to use a RADIUS server...

You must have the **username(s)** and **IP address(es)** of the RADIUS server(s) that you wish to use. The Router will prompt you to provide the name(s) and password(s) configured on those server(s).

5.4.3 Modem Parameters

- *modem0*—The first modem interface.
- *modem1*—The second modem interface (Async Router AR-5 only).
- *modem2*—The third modem interface (Async Router AR-5 only).
- *modem3*—The fourth modem interface (Async Router AR-5 only).
- *modem4*—The fifth modem interface (Async Router AR-5 only).
- *type of system*—Select the type of remote system to be connected to the Router via the modem port. Typically, this remote system is a Router or a remote client, but can also be a Livingston Portmaster, Telebit® NetBlazer®, or other similar system.
- *Phone #*—Enter the telephone number of the remote system. The telephone number must begin with a numeral and may contain special characters, such as commas, to indicate a pause. For more information, refer to the *Reference Guide*.

- *Maximum number of minutes*—For dialup interfaces only, this parameter limits the time allowed per day for a dialup interface. Also known as the dialup quota.
- *Name*—Enter name of the remote system. This name must be identical to the system name configured on the remote system.
- *Authentication*—Specify either PAP, CHAP, or none, whichever is appropriate for the remote site. If the remote system does not support CHAP, then disable this encryption function by entering N, or by using the *ppp* command later. The Router supports PAP and CHAP, and defaults to CHAP.
- *Link password*—For PAP and CHAP Only. Enter the password required to access the remote system. A link password is required for PAP or CHAP authentication on the WAN interface. The link password is used by a remote Router (or other remote system) to access the local Router using the WAN port. This link password must be identical to the link password configured on the remote Router (or system).
- *IP address*—Enter the IP address for the remote system, using dotted-quad notation: *d d.d.d*, where *d* is a decimal number, and 0<d<255.
- *IP subnet mask*—Enter the subnet mask for the remote system, in decimal dotted-quad notation. The subnet mask defaults to all ones for the network portion and all zeroes for the host portion, which corresponds to the class of the IP address entered. Refer to **Table 5-1**.
- *Login name*—Enter the name required to log into the remote system. The login name for the remote system is not necessarily the name used during PAP/CHAP authentication. The Livingston Portmaster and the Telebit NetBlazer can be configured to present a login and password prompt to systems attempting to connect. The Router sends the login name in response to the "login:" prompt from the remote system.
- *Login password*—Enter the password required to log into the remote system. The login password is not necessarily the link password used during PAP/CHAP authentication. The Router sends the login password in response to the "password:" prompt from the remote system.
- *Script name*—The name of the file that contains the dialer script used when the Router connects to the remote system. If you choose a Livingston Portmaster or Telebit NetBlazer as the remote system, a dialer script is provided on the Router diskette. If you specify "Other," you must provide a dialer-script filename.
- *Default route*—To ensure that traffic with unknown addresses is handled properly (typically passed to the Internet), you can choose to set a default route through any interface. The interface for the default route must be selected by your network administrator, because the entire network must be considered.

  When configuring a Router link between two sites, one site is designated as the home office and the other site designated as a branch office. If the system at the other end of the line on this interface is the home office, then the default route will be set through that interface so that all traffic to destinations not on your local network is sent to the home office.

  If you are configuring a Router with more than one WAN interface, this question is asked for each WAN interface until a default route is chosen. Indicate the default route through the interface that connects to the home office by answering yes for that interface. Once you have set the default route, the question is not asked again. If neither site is the home office, answer no to the question each time.

NOTE

It is possible to set the default route to point to a node on the Router's Ethernet.

- *Remote Client IP address*—Enter an optional IP address a remote client uses to access the Router using that modem port. You or your network administrator must decide whether to assign an IP address to a remote client modem. The default is no IP address assigned to a remote client when they dial in.

  If you assign an IP address to a modem line that is configured for client access (on the Router), then that IP address is automatically assigned to the remote client, during the remote-client login process. Any remote client application (operating on the remote user's PC) must be configured with the same IP address (assigned to the line used for the client to dial in). The IP address assigned by the Router (to the Router modem) always overrides any IP address set by the remote client application.

  If you choose not to assign an IP address to a modem, then the remote client application must supply the IP address to be assigned to the remote client at login time. To configure a client's IP address in the Remote Office software, click on the More button for your phonebook record, and then click on the Protocol button.

NOTE

The IP address assigned to the remote client must always be a valid IP address on the subnet to which the Router is attached.

  Client access is not supported over the sync0 interface (Sync Router).

- *client access shift*—Enter the client access shift, which is valid for all modems configured for client access. The Router uses the client access shift to restrict remote client access to a specific time period: either inside of (during) the client access shift, outside of (not during) the client access shift, or both insid e and outside of the client access shift.

  The client access shift is designated by a starting time and an ending time, in standard 24-hour format (0800 corresponds to 8:00 AM, 1700 corresponds to 5:00 PM, etc.). A sequence of letters corresponds to the days of the week for which the client access shift applies:

- M for Monday,
- T for Tuesday
- W for Wednesday
- R for Thursday
- F for Friday
- S for Saturday
- U for Sunday

  Enter the starting time, the ending time, and the days of the week, on the same line, separated by single spaces. For example, "0800 1700 MTWRF" defines a typical 8-a.m. to 5-p.m. workweek.

5.4.4 Sync Router Parameters

Parameters specific to the Sync Router are listed here. Refer to the Modem parameters section for parameters not listed here.

- *sync0*—The synchronous interface (Sync Router only).
- *Is this a leased line?*—Enter yes or no. You can use the sync0 port to connect to another Sync Router (or other similar system) either via a leased line (dedicated) or via a non-leased line (switched circuit).

A leased line is a type of phone service that offers a continuous connection between two sites, typically at data rates of 56 Kbps (USA) or 64 Kbps (Europe). Leased lines are often referred to as DDS lines (digital data service).

A non-leased line (switched), such as Switched-56, offers a high-speed dialup connection (typically 56 Kbps).

- *Use as a backup?*—For leased lines only, the analog modem (modem0) on the Sync Router can be used to establish a second dialup connection to the same remote site. This second line would not be used unless the sync0 port ceased to work correctly.

  The analog modem can be used as a backup connection for leased lines, but not for non-leased (switched) lines.

5.4.5 IP Firewall Parameters

Parameters specific to the IP firewall feature on Routers are listed here.

Do you want the firewall described in the documentation?

Answer yes if you want to install a list of IP filters designed to protect your network when the Router is used to provide Internet access.

Public server IP address

Enter the IP address of the public server on the LAN connected to the Router.

Do you allow TELNET to the server (n):

If you want to allow telnet activities to your public server from outside of your network, enter "y" to this question.

5.4.6 Client Parameters

NOTE

If you have chosen to use a SecurID or RADIUS server, you do not have to configure clients on the Router.

Client parameters are configured for each remote client. The Router gives you the option of using Express Setup, to choose the following default values for access time, time quota, idle time, and no callback:

- access time both inside and outside of the client access shift
- 1440 minutes time quota
- 240 seconds idle time
- no callback phone number (disabled)

To add many remote clients easily, with the default values above, use this faster method.

Express Setup assumes default values, so you enter only for each client: client name, client password, and if the client is enabled. After you completely enter the data for one client, the Router prompts you for another client. If you do not want to add more clients, enter **n**, and press RETURN. The Router saves all remote client information on the diskette.

- *client access shift*—Refer to **Section 5.4.3**.
- *client name*—Enter the name of the remote client. The client name must be 8 characters or less and is not case-sensitive. The remote client application for the client must be configured with the same client name.
- *client password*—Enter the password for the remote client. The client password must be 8 characters or less and is not case-sensitive. The remote client software for the client must be configured with the same client password.
- *enable client*—Enter y to enable the client, or n to disable the client. If a remote client is enabled, then the client can access the network via the Router, during the time interval determined by the client's access time and the client access shift of the Router. If a remote client is disabled, then the client cannot access the network via the Router at any time.
- *access time*—Enter the access time code for the client. Enter 1 for access during the client access shift, 0 for access at any time not during the client access shift, or B for access at all times. The access time for a remote client is defined in terms of the client access shift for the Router. Access time is either inside of (during) the client access shift, outside of (not during) the client access shift, or both inside and outside of the client access shift (24 hour access).
- *time quota*—Enter the time quota for the client, in minutes per day, from 0 to 1440. The default time quota is 1440 minutes (24 hours). The time quota limits the amount of Router connection time allowed each day, for each remote client (with callback enabled). Time accrues against the time quota only when the Router initiates a callback during the authentication process. When a remote client (without callback enabled) initiates a call, that time is not accrued against the time quota.
- *idle time*—Enter the idle time desired, in seconds (0 to 86400). The idle time default is 240 seconds (4 minutes). The idle time is the time allowed before the Router drops the telephone line, when there is no network traffic over that line. After the telephone line is dropped, the remote client must re-initiate the login and authentication process, in order to connect. To log back into the Router after the idle timer has expired, choose "Login to a Router" from the Connection menu of the DOS or Windows interface. Note that the Router and remote client must go through authentication each time that a client dials in.
- *callback phone number*—Enter the telephone number where the client can be reached. The telephone number must begin with a numeral, and may contain special characters. The default for each client is no callback number.

  If callback is enabled, after normal client authentication, the Router puts the client into auto-answer mode, disconnects the telephone line, and calls the client back at the callback number. This ensures that the remote client is accessing the network from a predetermined location and telephone number. Note that there is no method for changing the callback number from the remote client side, which is what makes it secure.

  The callback number is a security feature that is only available if the remote client is using the Async Client remote access software (called Remote Office).

6. Configure and Test

This chapter illustrates how to:

- Configure hosts on your TCP/IP network to interoperate with the Router
- Test Router TCP/IP installations using ping
- Test Router IPX installations using ping

If you are not running TCP/IP on your network, proceed to **Section 6.3** and test your network.

If you are running TCP on your network, configure your hosts and then proceed to **Section 6.2**.

6.1 Configure Hosts on TCP/IP Network

You might need to reconfigure some of the hosts on a TCP/IP network (LAN) to interoperate with a Router.

1. Add the name and IP address of your Router to each host that accesses it.

   For Sun 4.x/BSD UNIX systems, add this line to the */etclhosts* or domain name data file (if you are using DNS) for each host you want to identify:

   Router_lP_address Router_name

   For example:

   ```
   192.1.1.1 salesoffcel
   ```

2. For BSD-based UNIX systems, reconfigure applications (that can time out) to allow 30 to 60 seconds for the worst-case dialup connection time.

   Note that the Router can take up to 30 seconds (or much less for sync) to establish the connection.

   To reconfigure the sendmail daemon for connection time, use one of the following two methods:

   Method 1

   Disable the periodic queue rescan from the sendmail daemon, and write a custom mini-daemon to execute from a root crontab entry to take two back-to-back passes at the sendmail queue each hour. Add these lines to *cron* fi1e:

   ```
   /usr/lib/sendmail -q #once to bring up the link
   /usr/lib/sendmail -q #once to deliver the mail
   ```

   Method 2

   Implement a set-UID root script to rescan the queue and invoke sendmail when the connection is brought up. Several IP service providers use this method for incoming-only lines. The *sendmail -R* string works.

3. If you are not using RIP on your network, add a route to the Router for each host on your network that accesses nodes on the remote network.

   On a Sun 4.x/BSD UNIX system, either add a default route to the Router by adding a */etc/defaultrouter* file containing the entry:

`Router_name or IP_address`

or add the following route command to the */etc/rc.local* file:

`route add` *remote_lP_addresslocal_Router_IP addressl*

4. Proceed to the next section, and test your network using ping.

6.2 Test TCP/IP Networks Using Ping

To systematically verify connectivity, power up the Router and observe the messages on the console. Establish a PPP connection on your WAN interface, using the update now command. If CHAP or PAP hasn't failed, then perform the "ping" tests. The ping tests provide a minimal set of results that can be used to help verify network connectivity and resolve problems.

To perform all of the ping tests, you will require the help of an associate at the remote site. If an associate is not available, then you can perform the first four ping tests.

On the diagram, circle the test numbers if the ping is successful, and record the IP addresses and subnet masks used. If desired, fax these two completed diagrams to your technical-support person.

For more information, refer to *ping* in *Section 4.10* of the *Reference Guide*, which begins on page 137. If you perform all of the steps here and still have problems, refer to **Appendix C** of this manual.

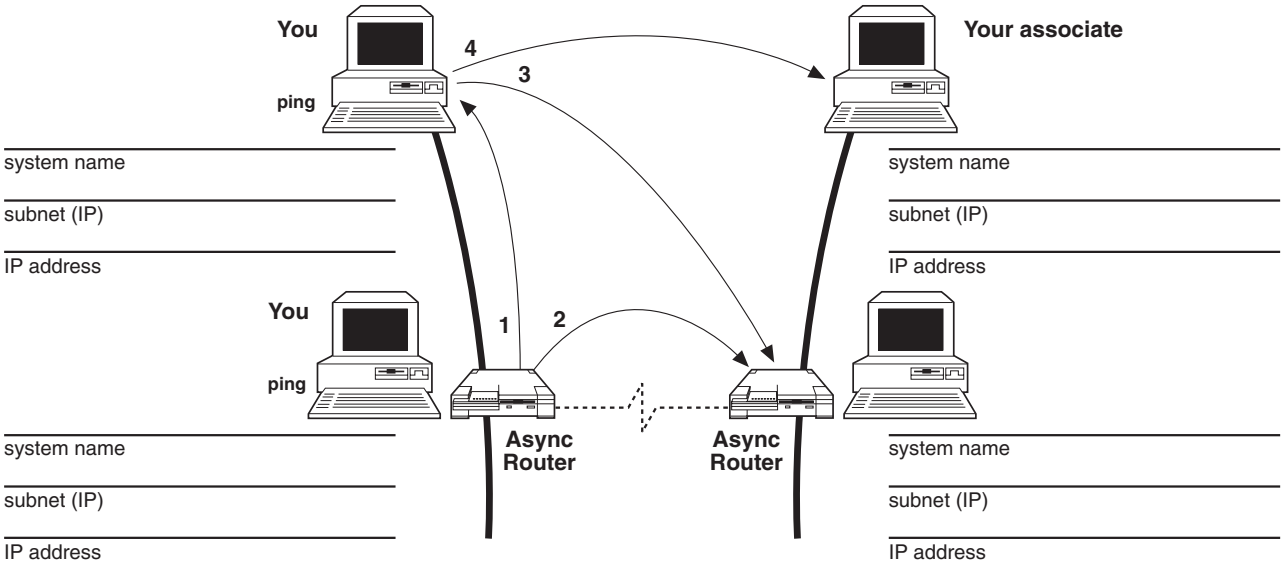

Figure 6-1. Ping from the Local Ethernet.

6.2.1 Ping from the Local Ethernet

Refer to **Figure 6-1**.

1. From the local Router, ping a workstation on the local Ethernet.

   Enter *ping IP_address* (of local workstation) and wait for the result. This test passes if you see a round-trip time displayed in milliseconds. This test fails if you see a response similar to "Target does not respond."

   If this test fails, then

- Make sure that the local workstation and local Router are physically attached to the same Ethernet, by checking the cables.
- Verify that the local host and local Router are configured with the same network number and subnet mask. Display the IP address and subnet mask for the Ethernet interface eth0 on the Router using the if config command. Consult the system administration manual for the local host to determine how to display the IP address and subnet mask for its Ethernet interface.

2. From the local Router, ping the remote Router.

- Establish a dialup connection from your Router to the remote Router. Use the *-s* option to continuously transmit the ping.

  On the local Router, enter:

  `ping -s` *IP_address_of_remote_Router*

  You should hear the modem dial, the remote system answer, and a series of tones. A Sync Router will not emit any sounds. When the speaker turns off the connection is made. This process can take up to 30 seconds (or much shorter, when using the sync0 interface). During this time the displayed response from the **ping** command is:

  ```
  Target did not respond
  ```

  Once the speaker turns off, the test is successful if a round-trip time to the remote system is displayed, similar to:

  ```
  Round trip time:  180
  ```

3. From a workstation on the local Ethernet, ping the remote Router. You should only do this test if you want the ability to configure the remote Router from this workstation on the local Ethernet.

   Enter *syslog on*. Next enter *ping -s [IP_address]* (of remote Router) and wait for the result. This test passes if you see a round-trip time displayed in milliseconds. This test fails if you see a response similar to "Target does not respond."

   If this test fails, then:

- Determine if a WAN connection has been established between two Routers. Use the d*ialup interface status* command for dialup connections (look for *called out* or *serving call*), or use the *ppp sync0* command for leased lines (look for *IPCP opened*).
- If the WAN link does not come up, try using *trace [interface]* to see what kind of traffic is traveling the link.

4. From a workstation on the local Ethernet, ping a workstation on the remote Ethernet. Wait up to 60 seconds for the result.

Enter *ping -s [IP_address]* (of remote workstation) and wait for the result. This test passes if you see a round trip time displayed in milliseconds. This test fails if you see a response similar to "Target does not respond."

If this test fails, then

- Have an associate perform tests 5-8 on the following pages.
- From a workstation on the local Ethernet, telnet to the remote Router, log in as root, and issue the *route* command.

6.2.2 Ping from the Remote Ethernet

Now have an associate at the remote site perform similar tests. Refer to **Figure 6-2**.

5. From the remote Router, ping a workstation on the remote Ethernet.

   On a remote Router, have an associate enter *syslog on*. Next have him enter *ping -s [IP_address]* (of remote workstation) and wait for the result. This test passes if you see a round trip time displayed in milliseconds. This test fails if you see a response similar to "Target does not respond."

   If this test fails, then

- Make sure that the remote workstation and remote Router are physically attached to the same Ethernet, by checking the cables.
- Issue a ping to another host on the remote network. From the Router enter:

  `ping` *IP_address_of_a_remote_node*

  If the **ping** command displays the message:

  ```
  Target did not respond
  ```

  refer to **Appendix C**.

6. From the remote Router, ping the local Router. Wait up to 60 seconds, or less (for sync transmission) for the result.

   On a remote Router, have an associate enter *syslog on*. Next have your associate enter *ping -s [IP_address]* (of local Router) and wait for the result. This test passes if you see a round-trip time displayed in milliseconds. This test fails if you see a response similar to "Target does not respond."

   If this test fails, then

- Enter *syslog on*.
- Establish a dialup connection from the remote Router to the local Router. Use the *-s* option to continuously transmit the ping.

  On the remote Router, have your associate enter:

  `ping -s` *IP address of local_Router*

  Your associate should hear the modem dial, the local system answer, and a series of tones. When the speaker turns off the connection is made. This process can take up to 30 seconds (or much shorter, when using the sync0 interface). During this time the displayed response from the ping command is:

  ```
  Target did not respond
  ```

Once the speaker turns off, the test is successful if a round-trip time to the local system is displayed, similar to:

```
Round trip time:  180
```

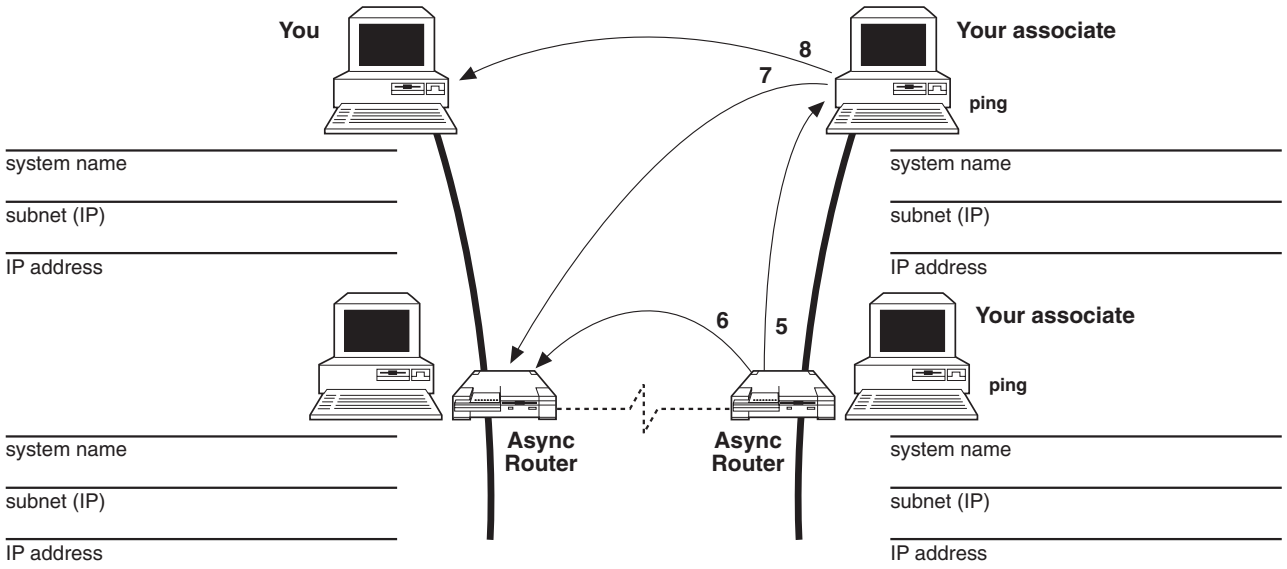

Figure 6-2. Ping from the Remote Ethernet.

7. From a workstation on the remote Ethernet, ping the local Router. You should only do this test if you want the ability to configure the local Router from this workstation on the remote Ethernet.

   On a remote workstation, have an associate enter *syslog on*. Next have your associate enter *ping -s IP_address* (of local Router) and wait for the result. This test passes if you see a round-trip time displayed in milliseconds. This test fails if you see a response similar to "Target does not respond."

   If this test fails, then

- Determine if a WAN connection has been established between the two Routers. Use the *dialup interface status* command for dialup connections (look for called out or serving call), or use the *ppp sync0* command for leased lines (look for IPCP opened).
- If the WAN link does not come up, try using *trace [interface]* to see what kind of traffic is traveling the link.

8. From a workstation on the remote Ethernet, ping a workstation on the local Ethernet.

   Have your associate enter *ping -s IP address* (of local workstation) and wait for the result. This test passes if your associate sees a round-trip time displayed in milliseconds. This test fails if he sees a response similar to "Target does not respond."

   If this test fails, then

- From a workstation on the remote Ethernet, telnet to the local Router, log in as root, and issue the *route* command.

6.3 Test IPX Networks Using RouterVu

To systematically verify connectivity, power up the Router and observe the messages on the console. Establish a PPP connection on your WAN interface using the *update now* command.

If CHAP or PAP hasn't failed, then perform the "ping" tests. The ping tests provide a minimal set of results that can be used to help verify network connectivity and resolve problems.

On the diagram, circle the test numbers if the ping is successful, and record the node names and network addresses used. If desired, fax these two completed diagrams to your technical-support person.

For more information, refer to "ping" in *Section 3.10* of the *Reference Manual*.

IPX RouterVu tests:

You must use a PC with RouterVu to run the following tests. You must have a NetWare File Server on your remote Ethernet, that is reachable through the Routers.

NOTE

For the ping tests to work, in your local SAP table you must be able to see the host that you want to ping. Otherwise the ping will not work.

1. Determine the IPX network numbers of the local and remote Ethernets.
2. Run RouterVu on your local PC and issue the following

```
routervu - a
```

The display should look similar to:

```
anole 00000020.02CF1F80060A (Router)
archer 00000040.02CF1F80060B (Router)
DAFFY 00DAFF11.00801B027521 (IPX File Server)
DAFFYII 00000043.00801B027520 (IPX File Server)
```

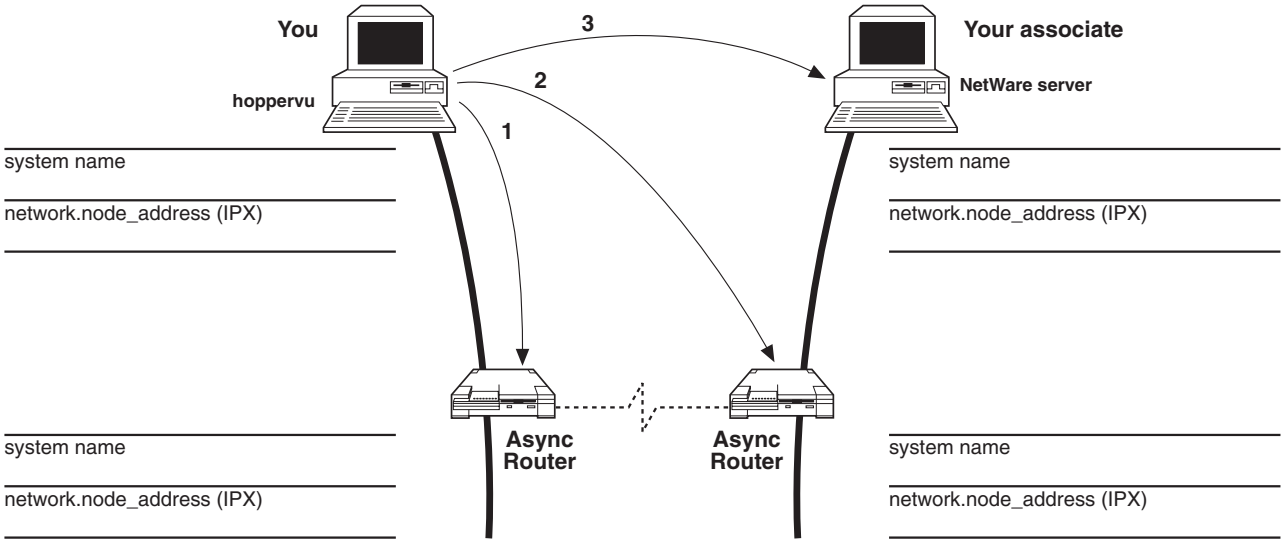

Figure 6-3. Ping from the Local Ethernet.

3. Find the local Router in the output from step 2 above. If the local Router is named *anole*, then it should look similar to:

   ```
   anole    00000020.02CFlF80060A (Router)
   ```

   This entry shows that *anole* is on IPX network number 20 (in hexadecimal) and has an Ethernet address of 02CFIF80060A.

4. From the local PC running RouterVu, ping the local Router using the following command:

   `routervu -p` *local_Router_name*

   If you don't see a response, check your cabling.

5. Find the remote Router in the output from step 2 above. If the remote Router is named *archer*, it should look similar to:

   ```
   archer   00000040.02CFlF800608 (Router)
   ```

   This entry shows that *archer* is on IPX network number 40 (in hexadecimal) and has an Ethernet address of 02CFlF80060B.

6. From the local PC running RouterVu, ping the remote Router using the following command:

   `routervu -p remote_Router_name`

   If the ping is not successful, wait approximately 45 seconds (if you're using modems) for the call between the local and remote Routers and try the ping again. If the ping is successful, continue to step 7.

   If a ping response is not displayed, then log in to the local Router and do the following:

   `routervu` *local_Router_name*

   Log in as root. Check the status of the WAN connection:

   For dialup interfaces (modems, sw56), enter:

   `dialup` interface `status`

   look for *called out* or *serving call*.

   For leased-line interfaces (sync0), enter:

   `ppp sync 0`

   Look for *IPXCP Opened*.

7. Find the remote NetWare fileserver in the output from step 2 above. If the remote fileserver is named DAFFYII, the it should look similar to:

   `DAFFYII  00000043.00801B027520 (IPX File Server)`

   This entry shows that "server_name" has an internal IPX network number of 43 (in hexadecimal) and has an Ethernet address of 000000000001.

   If you find an entry for the remote NetWare file server, continue with step 8.

   If you do not see an entry for the remote NetWare fileserver, ask your associate at the other end of the link to see if a SAP entry is present for it on the remote Router.

8. From the local PC running RouterVu, ping the remote NetWare fileserver using the following command:

   `routervu -p` *server_name*

   If the ping is successful, you have successfully completed initial IPX connectivity testing.

   If the ping is not successful, wait approximately 45 seconds (if using modems) for the call between the local and remote Routers, and try the ping again.

   If the ping is not successful, ask your associate to run ping from the remote Router to the remote NetWare fileserver.

Appendix A: Networking Examples

This appendix describes two typical Router installations:

- dialup LAN-to-LAN,
- synchronous LAN-to-LAN.

A.1 Dialup LAN-to-LAN

A.1.1 Using Names and Passwords

To provide basic security for your network, each Router is configured with a name, a root password and a link password. The Router name and link password are required when connecting to or from a remote router. The root password is additionally required to establish a telnet or ftp session (TCP/IP only) to the Router, or to establish a RouterVu session (IPX only) to the Router, or when logging in on the system console.

For security on the WAN interface, the Router can use either the Password Authentication Protocol (PAP) or Challenge Handshake Authentication Protocol (CHAP). The Router is configured to enable CHAP by default. The CHAP and PAP "handshake" requires a name and link password pair from each router. For example, when router A connects with router B, router A must present router A's name and link password to router B. Conversely, when router B connects with router A, router B must present router B's name and link password to router A. The name and link password for both ends of the link are maintained in the password file on the Router diskette. If the PAP or CHAP handshake does not complete successfully, the two devices are not allowed to communicate.

Name and password security is further illustrated by the following example. Consider the network connections made by Routers with the following system names, link passwords, and password file entries:

Table A-1. Connection Example: Async Router AR-5 to Async Router AR-Ps.

System	Name	Link Password	password file entries name/password
Async Router AR-5	paris	all2paris	hamburg/ham2paris london/lon2paris northridge/nor2paris
Async Router AR-P	hamburg	ham2paris	paris/all2paris
Async Router AR-P	london	lon2paris	paris/all2paris
Async Router AR-P	northridge	nor2paris	paris/all2paris

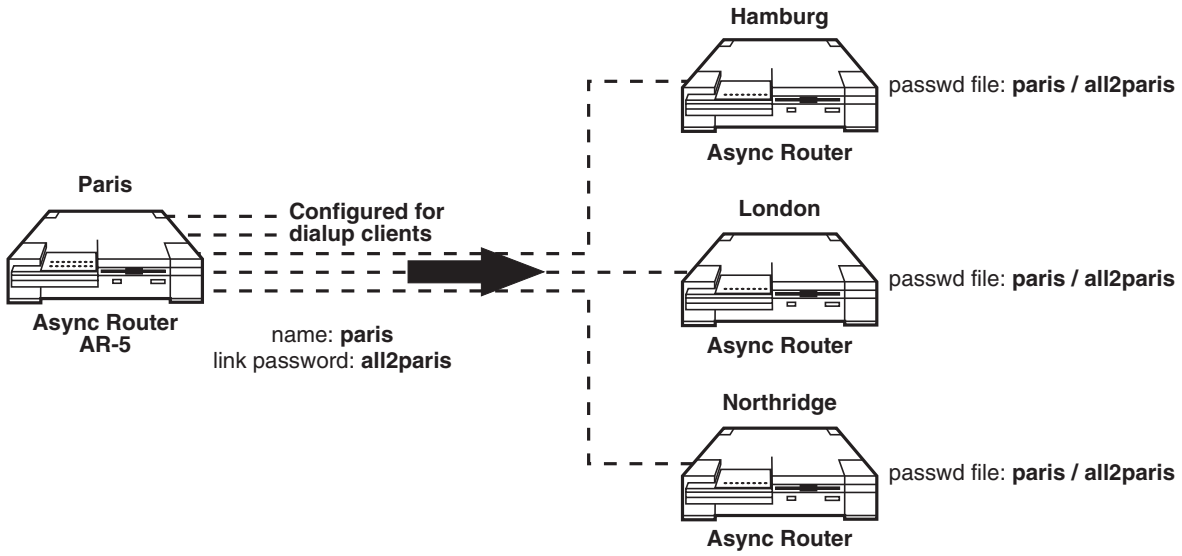

Figure A-1. Connection Example: Async Router AR-5 to Async Router AR-Ps.

When the Async Router AR-5 calls any of the Async Router AR-Ps, the name (paris) and password (all2paris) are sent on the modem links in figure A- 1. Each Async Router AR-P's password file contains an entry for the host paris with the link password all2paris. **Figure A-2** illustrates the handshake when any of the Async Router AR-Ps call the Async Router AR-5.

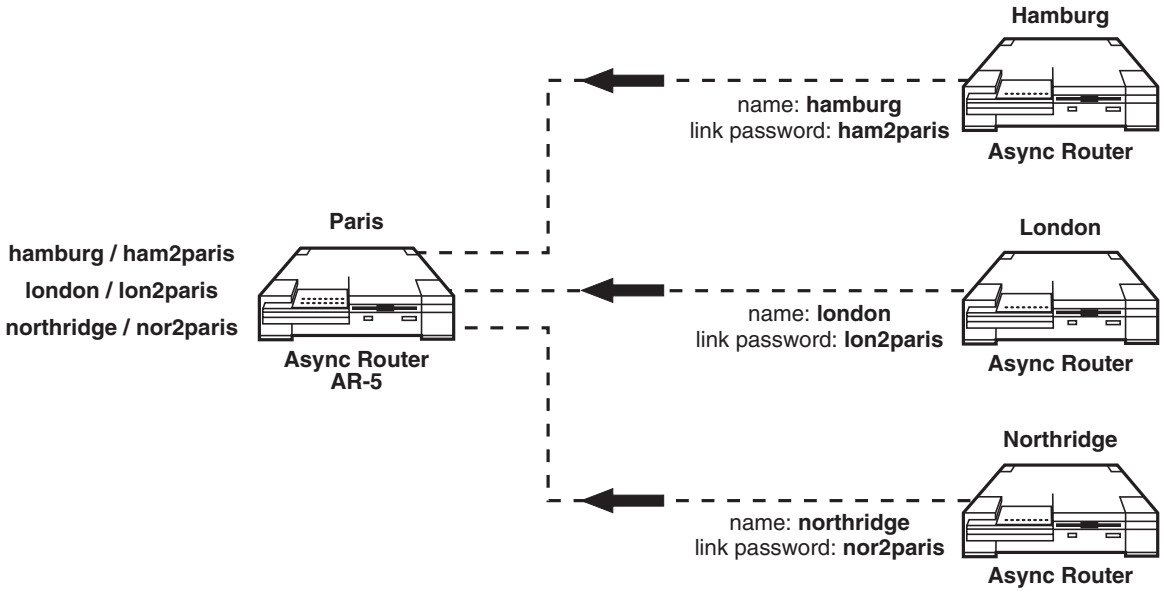

Figure A-2. Connection Example: Async Router AR-5 to Async Router AR-P.

NOTE

If the name or link password of a Router (or other router) changes, all remote system password files that it logs into must be changed, or the authentication handshake will fail.

Names and link passwords are specified during the initial configuration of the Router. To change the name or link password later, use the config modify or the password commands . The names and link passwords at local and remote sites must correspond exactly, in order to successfully connect the two sites.

Figure A-3 shows the name and link password relationships between local and remote sites, as they would be specified during the initial configuration of those sites.

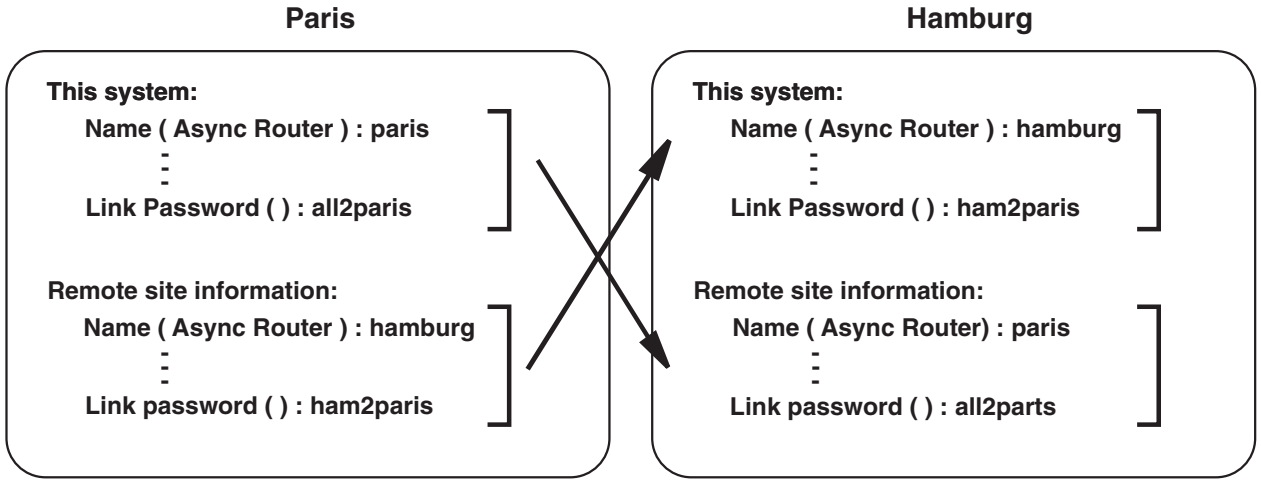

Figure A-3. Entering Names and Passwords During Initial Configuration.

A.1.2 Home/branch Office Designation

For each Router WAN link, one site is designated the home office and the other site is designated the branch office. The home office is usually a central site that may be attached to the Internet, and to connecting branch offices.

When a remote site is designated as a branch of fice (with IP routing enabled), a default route for the modem interface is added. When the remote router doesn't know how to reach an address, it sends the traffic for that address to the home office, using the default route.

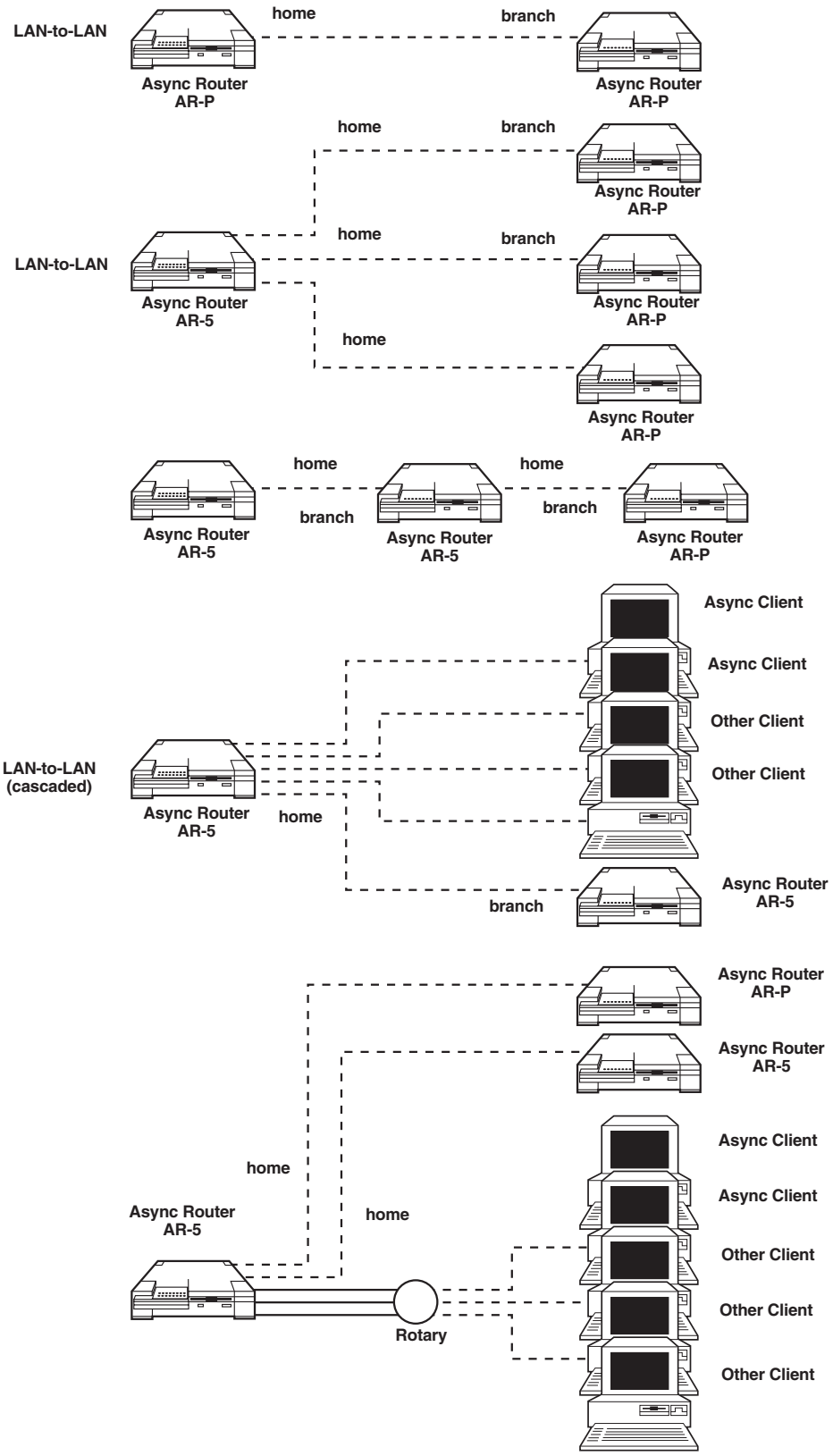

Figure A-4. Typical Configurations with Home and Branch Offices.

A.2 Synchronous LAN-to-LAN

This example illustrates how the Sync Router uses its integrated modem as a backup for a synchronous connection. Consider the network and the routing tables given for the systems in **Figure A-5**.

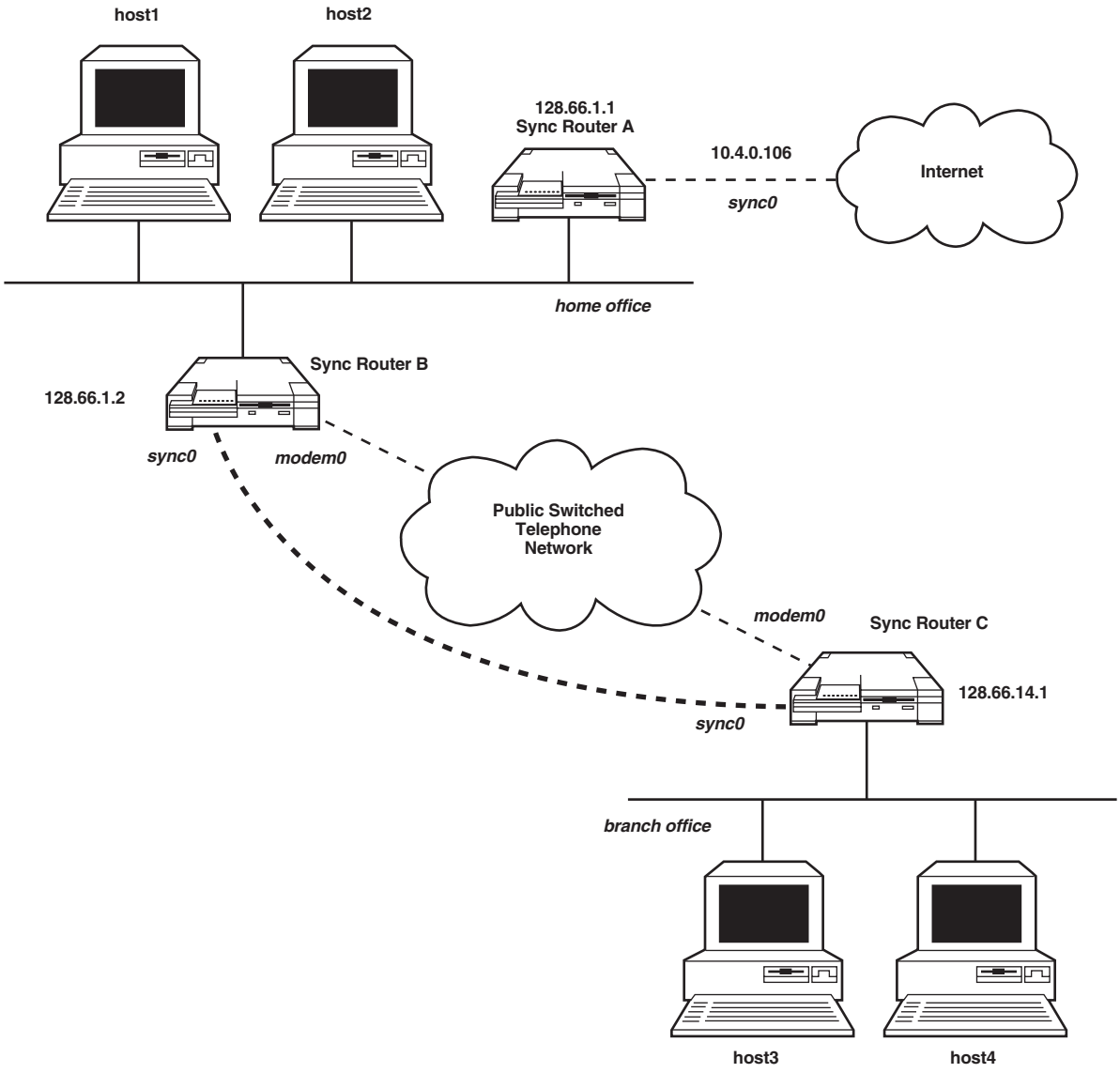

Figure A-5. Modem as a Backup for a Synchronous Connection.

The routing table entries are:

• Sync Router A

```
Destination     /Bits      Interface Router/Next     Hop Metric


128.66.0.0      /16        eth0                      0
128.66.14.0     /24        eth0       128.66.1.2     2
default         /0         sync0      10.4.0.106     1
```

• Sync Router B

```
Destination     /Bits      Interface Router/Next     Hop Metric


128.66.14.0     /24        sync0      128.66.14.1    1
128.66.14.0     /24        modem0     128.66.14.1    3 redundant
128.66.0.0      /16        eth0                      0
default         /0         eth0       128.66.1.1     1
```

• Sync Router C

```
Destination     /Bits      Interface Router/Next     Hop Metric


128.66.14.0     /24        eth0                      0
default         /0         sync0      128.66.1.2     1
default         /0         modem0     128.66.1.2     3 redundant
```

Router B has redundant routes to the 128.66.14.0 subnetwork. Similarly, Router C has redundant default routes. As long as the synchronous link is operational, Router B will use it to reach subnetwork 128.66.14.0, because the route through the sync0 interface has a lower hop count (metric=l) than the route through modem0 (metric=3):

Similarly, Router C uses the synchronous link to reach any other location, because the route through the sync0 interface has a lower hop count (metric=l) than the route through modem0 (metric=3).

If the synchronous link fails, Router B and Router C maintain connections by automatically transferring traffic to their integrated modems.

Appendix B: Line Use

Use the procedures in this appendix to minimize telephone costs associated with dialup connections: over modem interfaces or switched synchronous (SW-56) lines.

This appendix describes:

- How to monitor line use
- How to limit line use

B.1 How to Monitor Line Use

While the Router is operating, monitor it for excessive line usage. Because of unforeseen sources of traffic, an incompletely configured network with a properly configured Router, can still produce excessive phone usage and costs.

Generally, the Router dialup line is most efficient when it is connected for less than 4-5 hours a day over a long distance carrier. To monitor the Router's telephone line usage:

- Determine sources of last 5 dials
- Listen to the modem's speaker (if the Router has a modem)
- Review syslog connection reports (IP networks only)
- Install usage warning process

NOTE

The Router never dials a client unless the client has dialed in, is acknowledged, is verified using a login name and associated password, and has security callback enabled.

B.1.1 Determine Sources of Last 5 Dials

Use the *dialup modemX dial_log* command to view the type of packets that caused the last five dials, for any of the WAN interfaces (modem, sync). For example, to examine what is going on with modem0, from *tcp/ip* mode enter

```
dialup modem0 dial_log
```

From *ipx* mode, enter

```
tcp dialup modem0 dial_log
```

B.1.2 Listen to the Modem's Speaker

If the modem speaker is enabled, it is activated whenever the Router places an outgoing call or answers an incoming call. During the first few days of operation, listen for frequent incoming or outgoing calls. Verify that any frequent calling is justified, by correlating it to the actual activities of your network users.

During an outgoing call, you will first hear the dial tone, then the modem dialing the number (using standard telephone touch tones), and then a series of tones while the modems make the connection. During an incoming call, you will not hear the dial tone or the dialing touch tones; you will only hear the modem-connection tones.

The Router modem should only operate when someone is attempting to communicate with a remote host, as when logging in or sending mail to a remote host. If the Router modem dials for no apparent reason, restrict use of the phone line until the source of the traffic is determined.

Use the *dialup volume* command to control the Router's internal modem speaker.

```
dialup modemX volume [off | low | medium | high]
```

B.1.3 Turn on syslog (IP and IPX networks)

To determine which host is initiating the majority of calls in an IPX network, turn syslog on. From *ipx* mode, enter the command:

```
tcp syslog on
```

Syslog messages will be displayed on the Router console, but are not saved (in a file).

To determine which host is initiating the majority of calls in an IP network, check your syslog host's syslog file. Each night at approximately midnight, the Router sends a connection report to the syslog host, if both the Router and host are configured correctly. Refer to the system administrator manual for your syslog host and the *syslog* command in the *Reference Manual*.

To create a useful syslog file, configure the Router with your syslog host IP address, and configure your syslog host to save Router syslog messages to a file. The syslog host address may be configured at any time using:

`syslog address` *host_address*

Whenever an outgoing call is made, a syslog message similar to the following will be sent to your syslog host (and/or the console):

```
router1 modem0 Dialing for 128.66.32.120:4466->10.0.0.1:25
```

In this example, the host with IP address 128.66.32.120 is attempting to contact the host with IP address 10.0.0.1. The Router senses that the modem connection is down and begins dialing this host. The numbers following the colon (:) are the TCP or UDP port numbers. Host 128.66.32.120 is sending a mail datagram to the mail daemon on port 25 of host 10.0.0.1. The port number of the destination host usually indicates the type of data being sent. Use all of this information to investigate the reason for the numerous calls.

The syslog details the amount of time spent on the phone for the current day. For example:

```
Jan 1 00:00:00 router1 modem0 Connections: in 2 (0:00:04:11)
out S (0:03:58:50)
```

This report shows that the Router named "router1" made 5 outgoing calls, for a billable total of 3 hours, 58 minutes, and 50 seconds and accepted 2 incoming calls. If there are many outgoing calls, you may want to restrict the Router's use of the telephone line. If there are many incoming calls from a system on a remote network belonging to your company, you may want to restrict the remote Router's phone use.

B.1.4 Set Up an Excessive-Use Warning (IP networks only)

You can configure the Router to send warnings during the day when more than a specified amount of time is used for outgoing calls on a given interface. First turn syslog on. From tcp/ip mode, enter

```
syslog on
```

Next enter the dialup warning command:

`dialup` *interface* `warning` *mins*

Whenever you have used more than mins minutes of time for outgoing calls in one day, a syslog message like this is sent to the syslog host and to the console:

```
router1 modem0 High usage, more than 240 minutes used today
```

In the example, the display indicates that the Router named *router1* has placed more than 4 hours (240 minutes) of calls using the *modem0* interface.

You can display the current warning setting by entering:

`dialup` *interface* `warning`

The default dialup quota for a WAN interface (modem, sync) is 24 hours per day, or 1140 minutes. Refer to the *dialup* command in *Section 2.9* of the *Reference Manual*, which starts on page 137.

B.2 How to Limit Line Use

If the Router's line use is excessive for an interface, you may want to limit it until you can determine the cause. Three methods are available:

- Set a dialup-time quota for that interface
- Use IP and IPX dial filters on that interface
- Use the Router link optimization suite of filters (NLO)

B.2.1 Set a Dialup Time Quota for that Interface

To restrict the outgoing dialup-line use by all hosts to a time quota limit, use the *dialup quota* command. This command limits the amount of outgoing calls to mins minutes per day. Enter:

`dialup` *interface* `quota` *mins*

Because incoming calls are not listed on your phone bill, they are not monitored. At midnight each night the quota is reset back to *mins* minutes for another 24-hour period. By default, the quota is set to 1440 minutes (24 hours)—in other words, no quota at all. If you desire a smaller dialup quota, create one using the dialup quota command.

When the quota on an interface *interface* is reached, any current connection is dropped and cannot be renewed until the quota is reset, either automatically at midnight or by issuing another *dialup quota* command. In addition, the following syslog message is sent to the syslog host and to the console:

```
router1 modem0 Dropping link, time quota of 480 minutes exceeded
```

After this time, data packets received at this interface are discarded, and the following syslog message is sent to the syslog host and to the Router's console:

```
router1 modem0 Can't dial, time quota of 480 minutes exceeded
```

You can display the current-time quota setting and the balance of outgoing connect time by entering either:

```
dialup interface status
```

or

```
dialup interface quota
```

A typical status display is:

```
(tcp/ip)croy> dialup modem0 status
modem0: (14400/V1.500-CP39F)
    DTR On  RTS On  CTS On  DSR On  RI Off  DCD Off
    demand   listening        Timeout: 65535       Idle: 0:02:29:16
    Remote phone: 14
    Total time con: 0:01:36:13  Time since last boot: 5:03:59:32
    Average daily connected time: 0:00:18:37
    Daily quota: 1:00:00:00  Used: 0:00:14:09  Left: 0:23:45:51
    Usage warning currently set at: 0:04:00:00
(tcp/ip)croy>
```

For more information, refer to the *dialup* command in *Section 2.9* of the *Reference Manual*.

Use dialup status to determine the amount of dialup quota available on a particular interface. Typically, if you are averaging 1 hour of outgoing connect time per day, set your quota to 2 or 3 hours.

NOTE

Set your quota time slightly higher than the amount of time you expect to use, to ensure that legitimate connections are not disrupted.

B.2.2 How to Temporarily Increase the Time Quota

You want to set the dialup-time quota higher than normal for a day, issue the *dialup quota* command to reset the time quota for the current day only. For example, if you have reached your normal limit of four hours (240 minutes), and want a few more hours to complete your work, then enter the command:

```
dialup modem0 quota 120
```

This command will reset the time quota to two more hours for today, for the modem0 interface. This command also sets the limit to a total of two hours on subsequent days. After using the increased time, remember to reset the time quota back to your normal limit tomorrow.

B.2.3 Use the Router's Predefined IP Filters

Typically, the Router can be configured to be the Internet entry point to the corporate network. All services that are defined to be reachable from the Internet are running on one public server. Other hosts (internal servers) cannot be reached from the Internet, but all local users are allowed to access servers on the Internet. When a Router is being used to provide Internet access for a corporate network, consider using the predefined IP filters to limit activities by Internet users who are ouside of your network. This list of IP filters is sometimes called an **IP firewall**.

There are two ways to install the predefined IP filters: during initial configuration or when executing *config modify*.

At the end of initial configuration, if the default route for an interface points to a serial point-to-point interface (synchronous or modem), you will be offered a standard firewall configuration. For the question "Install standard Internet access firewall on iface?" answer Y to install the suite of predefined IP filters.

When executing **config modify**, answer Y to the same question in the previous paragraph, to install the IP filters. If there are filters already present with reserved names, and you request the standard firewall, all filters with names that begin with "$" are deleted, before the standard firewall is generated.

List of predefined IP filters

The predefined IP filter statements are:

1 filter add $OUTOK -f outbound -t allow

2 filter add $TCPOK -p tcpestab -t allow

3 filter add $FAKE25 -i iface -p tcpnew -s 25 -t deny

4 filter add $NOLOOP -s 127.0.0.0/8 -t deny

5 filter add $NORCMD -p tcp -d 512-515 -t deny

5a filter add $NOTN -p tcp -d 23 -t deny

6 filter add $SRVOK -p tcp -d server/32 -t allow

7 filter add $MAIL1 -i iface -p tcp -d 25 -t allow

8 filter add $MAIL2 -i iface -p tcp -s 25 -t allow

9 filter add $FTP1 -i iface -f inbound -p tcp -s 20 -t allow

10 filter add $DNS1 -i iface -p tcp -s 53 -t allow

11 filter add $DNS2 -i iface -p tcp -d 53 -t allow

12 filter add $DNS3 -i iface -p udp -s 53 -t allow

13 filter add $DNS4 -i iface -p udp -d 53 -t allow

14 filter add $RIP1 -i iface -p udp -s 520 -t allow

15 filter add $RIP2 -i iface -p udp -d 520 -t allow

Your customized filters are inserted here.

16 filter add $NOUDP -i iface -p udp -t deny

17 filter add $NOSRV -i iface -p tcpnew -f inbound -t deny

18 filter enable

Filter statements 1–15 are placed before any user-defined filter statements. Items 16–17 are placed after any user-defined filter statements.

Individual entries in the filter list accomplish the following:

1 **filter add $OUTOK -f outbound -t allow**
No outgoing packets need to be filtered. (Saves processing time).

2 **filter add $TCPOK -p tcpestab -t allow**
Packets on established TCP connections do not need to be filtered. (So any mention of TCP beyond this point in the list pertains only to NEW connections.)

3 **filter add $FAKE25 -i iface -p tcpnew -s 25 -t deny**
Prevents people from sneaking in with a remote client, that is pretending to be a remote mail server.

4 **filter add $NOLOOP -s 127.0.0.0/8 -t deny**
Block packets resulting from misconfigured DNS resolver.

5 **filter add $NORCMD -p tcp -d 512-515 -t deny**
Do not allow R-series commands across the link.

5a **filter add $NOTN -p tcp -d 23 -t deny**
If telnet is not allowed, block it.

6 **filter add $SRVOK -p tcp -d server/32 -t allow**
Allow connections to the local server host.

7 **filter add $MAIL1 -i iface -p tcp -d 25 -t allow**

8 **filter add $MAIL2 -i iface -p tcp -s 25 -t allow**
Allow all of your users to send and receive email.

9 **filter add $FTP1 -i iface -f inbound -p tcp -s 20 -t allow**
Allow inbound connections to the local FTP client data port.

10 **filter add $DNS1 -i iface -p tcp -s 53 -t allow**

11 **filter add $DNS2 -i iface -p tcp -d 53 -t allow**

12 **filter add $DNS3 -i iface -p udp -s 53 -t allow**

13 **filter add $DNS4 -i iface -p udp -d 53 -t allow**
Allow local machines full use of DNS.

14 **filter add $RIP1 -i iface -p udp -s 520 -t allow**

15 **filter add $RIP2 -i iface -p udp -d 520 -t allow**
Allow RIP packets across the link.

Your customized filters are inserted here.

16 **filter add $NOUDP -i iface -p udp -t deny**

17 **filter add $NOSRV -i iface -p tcpnew -f inbound -t deny**
Deny all services not mentioned above, for UDP and TCP.

18 **filter enable**
Enable all filter statements.

B.2.4 Use the Router's Predefined IPX/SPX filters

Idle and unnecessary IPX and SPX packet transmission can be selectively restricted by Router's dial suppression feature (called RLO). RLO is essentially a predefined group of IPX and SPX filters, that filter unnecessary calling (calling not initiated by the user).

Using NLO, you can separately enable the Router to suppress dialing due to:

- Pings from NetWare servers
- SPX idle traffic
- NetBIOS name broadcasts between servers
- Any other IPX broadcasts

RLO reduces line use due to applications like Lotus® Notes, Windows® for Workgroups, Novell NetWare Management System, and Cheyenne® ArcServe.

How to enable all RLO filters

Enter the following command to start the RLO filters:

```
ipx optimization on                enable all NLO filters
```

When NLO is enabled, the Router is automatically configured to minimize unnecessary dialing.

How to disable the NLO filters

Enter the following command to disable the NLO filters:

```
ipx optimization off               disable all NLO filters
```

B.2.5 Write Your Own IP and IPX Filters

To prevent certain hosts or networks from making connections with your Router, employ an IP or IPX dial filter. Using dial filters does not restrict all hosts on your own network, as the dialup-quota method does.

Dial filters are best used to restrict the access of specified hosts, networks and applications.

Use the ***-t* nodial** parameter of the **filter** command to create IP dial filters.

Use the **filter**, **ripfilter**, or **sapfilter** command to create IPX dial filters.

Simple IP filter example

A branch-office LAN is connected to its home office through a Router, and the home office is connected to the Internet. To prevent hosts on the Internet from routing through your home office over the dialup connection to your remote office, install an IP dial filter. For example, domain-name packets entering the system with a destination port number 53 cannot be sent to the remote office on the modem0 port when the following command is entered to the home-office Router:

```
filter add dnsfilter -d any 53 -t nodial -i modem0 -f outbound

filter enable
```

Also refer to the *filter* command in *Section 3.6* of the *Reference Manual*, which begins on page 137.

NOTE

If a dialup connection has already been established between offices, the filter does not prevent the packets from transitioning the link. The filter only prevents packets from causing the Router to initiate the connection by dialing out.

Long IP filter example

These filters can be entered from the Router command prompt. Do not use the IP addresses below. They are for EXAMPLE ONLY! Comments are preceded by "#". The filters are executed in order, and the overall filtering depends upon the interplay of all of the filters.

```
#These filters will allow your network users to ping to hosts in the
outside world.

filter add f0 -s 199.98.122.1/32 -p 1 -t allow
filter add f00 -d 199.98.122.1/32 -p 1 -t allow
filter add f1 -s 199.98.122.3/32 -p 1 -t allow
filter add f2 -d 199.98.122.3/32 -p 1 -t allow

#These filters will allow FTP activities to and from the host
with IP address 199.98.122.3.

filter add f3 -s 199.98.122.3/32 -d any 20 -p 6 -t allow
filter add f4 -s any 20 -d 199.98.122.3/32 -p 6 -t allow
filter add f5 -s 199.98.122.3/32 20 -p 6 -t allow
filter add f6 -d 199.98.122.3/32 20 -p 6 -t allow
filter add f7 -s 199.98.122.3/32 -d any 21 -p 6 -t allow
filter add f8 -s any 21 -d 199.98.122.3/32 -p 6 -t allow
filter add f9 -s 199.98.122.3/32 -p 6 -t allow
filter add f10 -d 199.98.122.3/32 21 -p 6 -t allow

#These filters will block telnet activities originating from the
outside world, but will allow your network users to telnet to the
outside world.

filter add f11 -d any 23 -p 6 -t deny -i modem0 -f inbound
filter add f12 -s 199.98.122.3/32 -d any 23 -p 6 -t allow
filter add f13 -s any 23 -d 199.98.122.3/32 -p 6 -t allow

#These filters will allow mail to and from the host 199.98.122.3.

filter add f14 -s 199.98.122.3/32 -d any 25 -p 6 -t allow
filter add f15 -s any 25 -d 199.98.122.3/32 -p 6 -t allow
filter add f16 -s 199.98.122.3/32 25 -p 6 -t allow
filter add f17 -d 199.98.122.3/32 25 -p 6 -t allow

#These filters will allow udp and tcp transfers.

filter add f18 -s 199.98.122.3/32 -d any 53 -p 6 -t allow
filter add f19 -s any 53 -d 199.98.122.3/32 -p 6 -t allow
filter add f20 -s 199.98.122.3/32 53 -p 6 -t allow
filter add f21 -d 199.98.122.3/32 53 -p 6 -t allow
filter add f22 -s 199.98.122.3/32 -d any 53 -p 17 -t allow
filter add f23 -s any 53 -d 199.98.122.3/32 -p 17 -t allow
```

```
filter add f24 -s 199.98.122.3/32 53 -p 17 -t allow
filter add f25 -d 199.98.122.3/32 53 -p 17 -t allow

#This filter will deny all inbound traffic EXCEPT for the traffic
allowed by previous filters.

filter add modemok -s any -d any -t deny -i modem0 -f inbound

#This command will enable all the filters listed previously.

filter enable
```

After filtering, reestablish dialup time quotas

Once sources of excessive dialing activities have been identified and filtered, you may want to increase the dialup time quota to allow for normal demand. Enter the following command for the new dialup quota:

`dialup` *interface* `quota` *mins*

This will set the quota to *mins* for the rest of the current day and for subsequent days.

NOTE

When the time quota is reached, phone connections are immediately dropped. For uninterrupted service, issue the above command before the quota limit is reached.

Appendix C: Troubleshooting

Use this appendix to resolve network problems during Router installation or operation.

We strongly recommend that you perform the ping tests described in **Chapter 6**.

There are several ways to use the information in this appendix:

- Use the LED descriptions to quickly determine which interface that the problem is occurring on.
- Use Router commands to discover more about your particular problem. Review the brief list of Router commands that are generally useful for solving network problems. Also refer to the complete descriptions in *Chapters 2, 3, and 4* of the *Reference Manual*, which starts on page 137.
- Using a description of your problem or an error message, look for a match in this appendix:
  - Initial configuration/start-up problems
  - Operating problems
  - Client problems

If you determine that the Router requires repair, refer to **Section C.6**.

Here is a list of common problems with the section numbers to look up for solutions:

- Initial configuration/start-up problems (**Section C.3**)
  - Router cannot start—LEDs stay dark (**Section C.3.1**)
  - Router cannot start—LEDs stay lit (**Section C.3.2**)
  - Prompt is not displayed (**Section C.3.3**)
  - Root password does not work (**Section C.3.3**)
  - IP hosts on Ethernet cannot telnet to the Router (**Section C.3.5**)
  - Cannot save configuration (**Section C.3.6**)
  - Modem will not connect to remote modem (**Section C.3.8**)
- Operating problems (**Section C.4**)
  - Cannot communicate with remote host (IP only) (**Section C.4.1**)
  - Connection drops after a few seconds (**Section C.4.2**)
  - Connection drops after a few hours (**Section C.4.3**)
  - Constant remote dialup (**Section C.4.4**)
  - NetWare servers are not displayed on remote host
  - Unable to attach to a remote NetWare server (**Section C.4.5**)

- Remote server not found (IPX) (**Section C.4.6**)
- No connection slots available (IPX) (**Section C.4.7**)
- Misconfigured networks (IPX) (**Section C.4.8**)

• Client operating problems (**Section C.5**)

- Router does not answer when client calls (**Section C.5.1**)
- Router answers client call but connection fails (**Section C.5.2**)

C.1 LED descriptions

C.1.1 Async Router AR-P LEDs

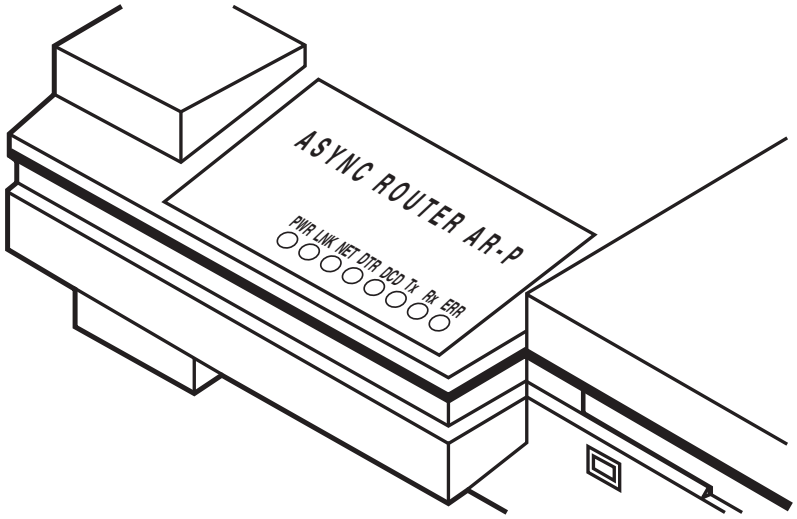

Figure C-1. LEDs on the Async Router AR-P.

Table C-1. Descriptions of the LEDs on the Async Router AR-P.

Label	Indicates	If the LED is on
PWR	Power	Router is receiving power
ERR	Error	System error is detected
LNK	Link status	Ethernet connection is functional
NWK or NET	Network activity	Router is receiving or transmitting data over Ethernet connection
DTR	Data terminal ready	Modem0 is ready to transmit
DCD	Data carrier detect	Modem0 is receiving carrier signal from remote modem
TX	Transmit	Modem0 is transmitting
RX	Receive	Modem0 is receiving

All LED lamps light as they are tested when the Router starts. They remain lit for 10 seconds before resuming normal operation.

C.1.2 Async Router AR-5 LEDs

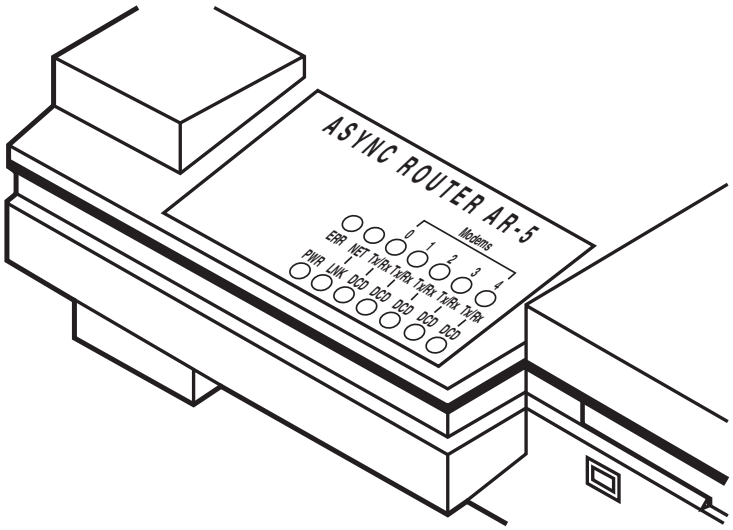

Figure C-2. Descriptions of the LEDs on the Async Router AR-5.

Table C-2. Descriptions of the LEDs on the Async Router AR-5.

Label	Indicates	If the LED is on
PWR	Power	Router is receiving power
ERR	Error	System error is detected
LNK	Link status	Ethernet connection is functional
NWK or NET	Network activity	Router is receiving or transmitting data over Ethernet connection
0-4 DCD	Data carrier detect	Modem (0-4) is receiving carrier signal from remote modem
0-4 TX/RX	Transmit/receive	Modem (0-4) is transmitting or receiving

All LED lamps light as they are tested when the Router starts. They remain lit for 10 seconds before resuming normal operations.

C.1.3 Sync Router LEDs

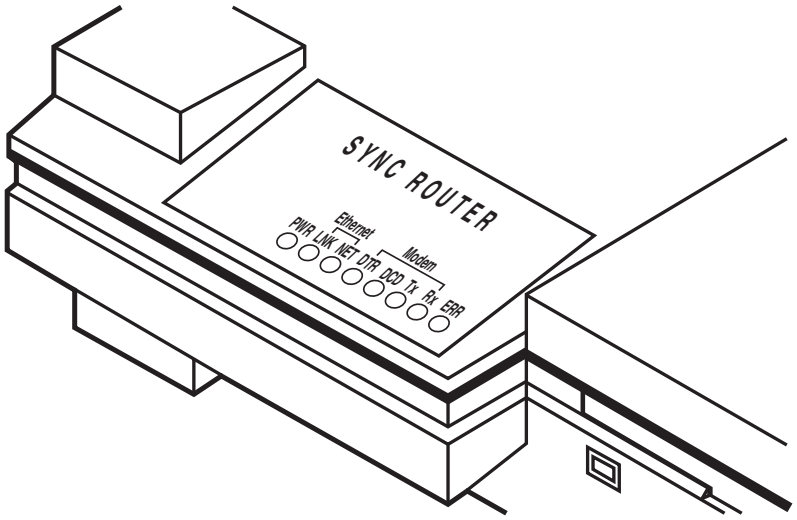

Figure C-3. LEDs on the Sync Router.

Table C-3. Descriptions of the LEDs on the Sync Router.

Label	Indicates	If the LED is on
PWR	Power	Router is receiving power
ERR	Error	System error is detected
LNK	Link status	Ethernet connection is functional
NET	Network activity	Router is receiving or transmitting data over Ethernet connection
DCD	Data carrier detect	Modem0 is receiving carrier signal from remote modem
DTR	Data terminal ready	Modem0 is ready to transmit
TX	Transmit	Modem0 is transmitting
RX	Receive	Modem0 is receiving

All LED lamps light as they are tested when the Router starts. They remain lit for 10 seconds before resuming normal operation.

C.2 Router Commands

Use the following commands to investigate problems with your Router. Use the prompt of the Router (*tcp/ip>* or *ipx>*) to remind you of which mode you are in (TCP/IP mode or IPX mode). Be aware that some commands can be used across modes, and others can only be used while in one of the modes. Note that some commands have the same name (*ifconfig*), but are mode-specific in their use.

C.2.1 For Any Type of Network (TCP/IP and IPX)

- *access*—display or change primary shift time for clients
- *asystat*—display interface statistics for Router
- *client*—display or change remote client data on Router
- *config*—display or change Router system configuration
- *date*—display or change date
- *default_mode*—display or set default protocol mode (*ipx* or *tcp/ip*)
- *dialup*—display or change dialup parameters
- *help*—display commands available
- *history*—display last 25 Router commands issued
- *hostname*—display or change name of Router
- *logout*—terminate session with Router
- *password*—change user or link password for Router
- *reboot*—drop all connections and restart Router
- *performance*—display network performance statistics
- *ppp*—display or configure PPP protocol parameters
- *ps*—display status of active Router processes
- *reboot*—drop all connections and restart Router
- *start*—start a server (ftp, rip, snmp, telnet)
- *stop*—stop a server (ftp, rip, snmp, telnet)
- *tip*—send modem commands to a remote modem
- *trace*—display packet types sent or received on a interface
- *tux*—display status of TUX protocol connections
- *update*—update routing tables using RIP and SAP
- *version*—display software release level of Router
- *who*—display who is logged in to Router

C.2.2 For IPX (NetWare) Networks Only

- *filter*—display or change IPX filters
- *if config*—display or change IPX network parameters
- *ipx*—display or change IPX protocol parameters
- *netstat*—display IPX network statistics
- *ping*—send an ICMP packet to remote host
- *ripfilter*—display or change RIP protocol filters
- *route*—display and change IPX routing tables
- *sap*—display and change SAP routing tables
- *sapfilter*—display or change SAP protocol filters
- *spoof*—enable or disable protocol spoofing
- *tcp/ip*—change to TCP/IP mode

C.2.3 For TCP/IP Networks Only

- *arp*—display or change ARP protocol parameters
- *domain*—configure for Internet domain name service (DNS)
- *filter*—display or change TCP/IP filters
- *icmp*—display ICMP protocol status
- *ifconfig*—display or change TCP/IP network parameters
- *ip*—display or change TCP/IP protocol parameters
- *ipx*—change to IPX mode
- *netstat*—display TCP/IP network statistics
- *ping*—send an ICMP packet to remote host
- *rip*—display or change RIP protocol parameters
- *route*—display or change IP routing table
- *snmp*—display or change SNMP protocol parameters
- *syslog*—display or configure system log
- *tcp*—display or configure TCP protocol parameters
- *traceroute*—trace the route to a host
- *udp*—display UDP protocol status

For detailed information about the use of these commands, refer to *Chapters 2, 3, and 4* in the *Reference Manual*, which begins on page 137.

C.2.4 RouterVu "Remote Console" for NetWare Networks

In IPX-only networks, use RouterVu on a PC to

- configure local Routers using a PC on the local Ethernet
- configure remote Routers
- troubleshoot network problems from both ends (Routers)

You can select a specific Router by name or IPX address (network number)

RouterVu enables users on IPX-only networks to log into and configure the Router remotely. RouterVu is a client/server application, with the client code running in DOS on a PC, and the server code running on the Router.

Syntax

```
routervu  [option]  [argument]
```

routervu—display RouterVu command syntax

routervu *target*—connect to the Router called *target*, or at the IPX network number target, and establish an interactive session

routervu -n—show names of all connected Routers

routervu -a—show names of all connected Routers and NetWare file servers

routervu -p—ping once to the remote Router

routervu -s—ping continuously to the remote Router

routervu -i *filename*—use the input file *filename* to generate commands for the Router

routervu -o *filename*—copy all output to the file *filename*

Examples

- Display command syntax of routervu command.

```
routervu
```

- Connect to a remote Router named Kansas.

```
routervu kansas
```

- List to screen all connected Routers.

```
routervu -n
```

```
ROUTERVU (c) 1995 Rockwell Network Systems
Building list...

anole 00001111.02CFlF80060A (Router)
archer 00001111.02CFlF800197 (Router)
arnie 00001111.02CFlF8006C8 (Router)
dinosaur 99990001.02CFlF80010F (Router)
dragon 12340001.02CFlF8001FC (Router)
hqs 00001111.02CFlF8004E7 (Router)
kato 12340001.02CFlF8005D7 (Router)
NDNLLl 00000011.02CFlF8001B7 (Router)
```

- List to screen all connected Routers and servers.

```
routervu -a

ROUTERVU (c) 1995 Rockwell Network Systems
Building list...

anole 00001111.02CFlF80060A (Router)
archer 00001111.02CFlF800197 (Router)
arnie 00001111.02CFlF8006C8 (Router)
DAFFY 00DAFF00.000000000001 (IPX File Server)
DAFFYII 00004321.000000000001 (IPX File Server)
dinosaur 99990001.02CFlF80010F (Router)
dragon 12340001.02CFlF8001FC (Router)
hqs 00001111.02CFlF8004E7 (Router)
```

- Copy all screen output to the file named *session.now*. This is useful to when trying to document the configuration of a remote Router.

```
routervu -o session.now
```

- Connect to a Router (iowa) and use the input file (*fix_iowa*) to generate Router commands (that are subsequently executed on that Router)

```
routervu iowa -i fix_iowa
```

- Connect to a Router (*boston*), capture all screen displays and put them into a file (*bstscms*). *routervu boston -o bstscrns*

```
routervu boston -o bstscrns
```

- Connect to a Router (paris), execute the commands in the input file (forparis), and capture the resulting output to another file (parisxx).

```
routervu paris -i forparis -o parisxx
```

C.3 Initial Configuration/Start-up Problems

C.3.1 Router Cannot Start—LEDs Stay Dark

- Power source problem
- Cannot read the boot diskette
- Unable to resolve an IP address

Possible cause #1—Power-source problem. LEDs on front panel are not illuminated.

Suggestion—Verify that the power cable is connected and well seated. Plug something else into the power source to verify that the wall outlet or power strip is active.

Possible cause #2—The Router cannot read the boot diskette or the boot diskette may be damaged.

Suggestion—Verify that the Router boot diskette is properly loaded into the floppy drive. As the Router attempts to start, check the LED on the front of the floppy-disk drive to see if the disk is being accessed. During the normal boot procedure, the disk access LED illuminates briefly during the system power-on self-test and again for 45 to 60 seconds while the Router system loads.

Upon successful start-up, the Router login prompt displays on the console, and a telnet or RouterVu session may be established.

NOTE

To telnet (IP only) or routervu (IPX only) to a Router, first run the setaddr program or complete a successful configuration from the Router console.

If the boot diskette appears to be accessed for the period described above, yet no login prompt displays on a configured console, or if you are unable to connect with telnet or RouterVu to the Router, try inserting the backup boot diskette and following the same start-up procedure.

If the disk does not appear to be accessed correctly or the problem is not resolved when using the backup diskette, call Technical Support.

If the problem is resolved by using the backup boot diskette, your boot diskette is probably damaged.

If the backup boot diskette appears to be accessed for the period described above, and you do not see a login prompt on an attached console, verify that the console terminal is connected correctly and is functional.

Possible cause #3 (IP only)—The Router is unable to resolve an IP address or the configured domain name server is unavailable.

Suggestion—While starting, check the disk access LED to see if the boot diskette is being accessed. During the normal start-up procedure, the disk access LED illuminates briefly during the system power-on self-test and again for 45 to 60 seconds while the Router system loads.

If the LED stays lit and you are using the domain name service to resolve hostnames to IP addresses, there may be a hostname in one of your start-up files that cannot be resolved, and is causing the start-up script to hang.

Router software stores IP addresses in dotted-quad notation in start-up scripts stored on the boot diskette. The only way a hostname can be found in a start-up script is if someone edits the Router boot diskette by hand. If your boot diskette has been modified this way, use a machine that can read and write DOS-formatted disks to edit the *confg.net* file on the boot diskette and change any hostnames to dotted-quad notation.

C.3.2 Router Cannot Start—LEDs Stay Lit

Although the boot diskette seems to boot properly and the Router LEDs stay lit, it will not start and will not give a prompt.

Possible cause—You may have infected the boot diskette with a virus.

If you have inserted the Router boot diskette into a PC on your network, it is possible that a computer virus was transferred to it.

Suggestion—Try using the backup boot diskette. Make sure you boot the diskette directly from the RouterVu or the Router. If you've corrupted your backup boot diskette, then call for technical support and order a new diskette. If you have virus-detection software, run it on the boot diskettes.

C.3.3 Prompt Is Not Displayed

No prompt is displayed on the console after the boot diskette appears to have been successfully read at system start.

Possible cause—The console terminal may not be connected or configured correctly.

Suggestion—See if the console works by connecting the console terminal to another machine. Verify that the null-modem cable is connected from the Router's console port to a terminal configured with a 9600 baud rate, no parity, 8 data bits, and 1 stop bit.

C.3.4 Root Password Does Not Work

Possible cause—The root password may have been changed, or you may have forgotten the password. Follow the instructions below to recover the password.

You can recover the system using the following procedure. These steps must be completed using a serial-port console. This procedure will not work from a remote telnet or RouterVu session.

1. Eject the boot diskette.
2. Write-protect the boot diskette, as shown in **Figure C-4**.

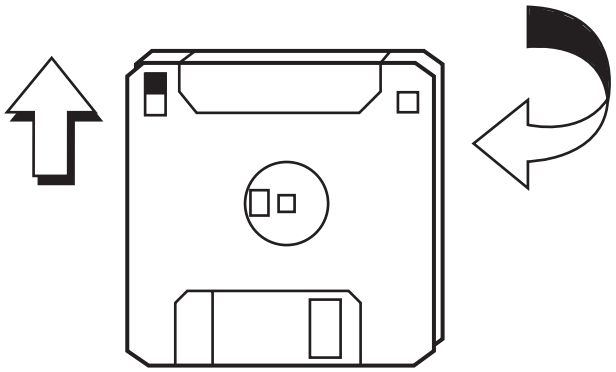

Figure C-4. To write-protect the disk, turn it over and open the window at the top left-hand corner.

3. Re-insert the boot diskette into the diskette drive.

4. Restart the Router.

5. Once the "Login:" prompt appears on the front panel, enter the user name *root*. Do not enter a password; just press RETURN.

NOTE

Step 5 can only works on the first login attempt after a reboot. If you make a mistake, reboot the Router as in step 4.

6. Eject the boot diskette and write-enable it (close the window).

7. Re-insert the diskette into the diskette drive.

8. Set the root password using the *password* command. The *-p* option of the *password* command allows the root password to be set without having to provide the previous password. The new password will be saved onto the diskette. Enter:

   `password -p`*new_password*

   Make sure that there is **no space between** the *-p* and the *new_password*.

C.3.5 IP Hosts on Ethernet Cannot Telnet to the Router

There are 2 possible causes:

- The Ethernet cable is not fully functional.
- The Router may be configured with the wrong IP address.

Possible cause #1—The Ethernet cable is not fully functional. The cable may not be connected correctly or it may be damaged.

Suggestions—Check the appropriate Ethernet cable to ensure that it is seated correctly.

Issue the *trace eth0* command on the Router to determine if the Router is receiving the telnet traffic. The trace command is used to display incoming and outgoing traffic on a given interface.

Watch the network activity LEDs while trying to access the Router over the Ethernet.

If possible, try attaching the Ethernet cable to another node on the same network that supports TCP/IP and telnet into it, to verify whether the cable is good.

If possible, use a network analyzer to determine if packets are being sent to the Router.

Possible cause #2—The Router may be configured with the wrong IP address.

Suggestions—If you have a machine available that supports DOS formatted disks, use an editor to read the *config.net* file on the boot diskette (or use the ifconfig command to display the IP address) and verify that the correct IP address is found in the file.

Before editing the boot diskette, uncompress it by entering:

`a: \stacker a:` <RETURN>

After making your changes, enter

```
exit <RETURN>
```

A line of the format "ip address xxx.xxx.xxx.xxx" will be found near the top of the file. If the address is incorrect, run *setaddr* again or edit the file directly to set the desired IP address for the Router. For more information about the *setaddr* utility, refer to **Chapter 3**.

Also—If the remote hosts support ping, use the *ping* command to verify connectivity. Issue the *ping* command on the machine from which you are trying to *telnet*. The destination address used when issuing the ping command should be the Router IP address. If you are able to successfully receive a response from the Router when using the *ping* command and are unable to *telnet* to the Router, call for technical support.

If possible, display the contents of the ARP table on the machine from which you issued the *telnet* command. See if there is a complete entry for the Router Ethernet/IP address mapping.

C.3.6 Cannot Save Configuration

The following message displays during configuration:

```
Cannot create configuration file config.tmp
Make sure the floppy disk is write enabled
```

Possible cause—The Router boot diskette is write-protected.

Suggestions—Remove the Router boot diskette and make sure that it is not write-protected (hole is not open). Complete the configuration procedure again and save it.

C.3.7 Why Don't the Modems Connect?

If you are having problems connecting over the WAN interface, you can enable additional error messages by using the command:

```
tcp syslog on
```

This will send all of the *syslog* messages to the console. When a dialup connection is made, you shoudl see messages such as:

```
iface dialup link appears to be up
```

or

```
iface CHAP peer says:  Welcome
```

If you see a message like:

```
iface call failed:  NO DIALTONE
```

then you may have a problem with your phone line. If you see a message like:

```
iface CHAP failed to verify:  remote name
```

then the names and link passwords between the two systems may not be set up correctly. Refer to the password example and worksheet in the *Installation Reference*, which begins on page 137.

When you are done, disable the *syslog* messages by issuing the command:

```
tcp syslog off
```

C.3.8 Modem Will Not Connect to Remote Modem

Possible causes—There are a variety of possible causes. Use this procedure to determine the most likely cause:

- the telephone circuit is overloaded
- the remote telephone number is not correct
- the local telephone circuit is faulty
- the remote modem is not compatible with Router's modem

Suggestions—Sometimes it is useful to go through the connection procedure manually and study the modem's output.

We strongly suggest that the Router always be used on a dedicated telephone line. If you are using the Router to make only outgoing calls to a network service provider (who will never call you), we recommend not sharing the line with other equipment, such as a fax-modem or a telephone. In order to reliably maintain the high data rates of the Router's built-in modem, other such equipment should only put a minimal electrical load on the telephone circuit. When having a problem with the modem connection, remove all other equipment from the line and make all telephone cords as short as possible. Sometimes a long telephone cord can act like an antenna and pick up noise.

To make sure that the remote number is being called correctly, turn the modem's speaker on with the command:

```
dialup modemX volume high
```

and listen as you type the command:

```
update modemX now
```

which should force the Router to make a call. If the remote number is good, you will hear the remote end ring, get answered, a whistle, and finally the rushing noise of the modem training sequence. If you don't hear these sounds, contact the remote site to make sure that you have the right telephone number, and that their equipment is ready to accept calls.

If all of these preliminary checks pass, but the modem still will not connect, try operating the modem manually.

1. Stop the dialer process. Enter:

   ```
   dialup modem0 inactive
   ```

2. Connect to the modem. Enter:

   ```
   tip modem0 <RETURN>
   ```

3. Make sure that the modem responds to commands. Enter:

   ```
   AT <RETURN>
   ```

   This should generate the "OK" response.

4. Turn the modem speaker on. Enter:

   ```
   ATM1L3 <RETURN>
   ```

5. Request detailed connection status messages. Enter:

   `ATW1` <RETURN>

6. Dial the destination telephone number *xxx-xxxx*. Enter:

   `ATDTxxx-xxxx` <RETURN>

   You should see the responses:

```
CARRIER 28800
PROTOCOL: LAP-M
CONNECT 57600
```

7. While holding the connection, get back into command mode with

   (pause) + + + *(pause)*

8. This should generate an "OK."

9. Enter:

   `AT%L`

10. This should return a number between 15 and 30. If the number returned is higher than 30, the telephone line is a poor connection. To determine which end has the problem, contact Technical Support. We can arrange for a test against our dial-in ports.

    If the dialing command gives one of the following responses at inappropriate times, contact Technical Support:

    `NO DIALTONE` (*if there IS a dialtone)*

    `BUSY` (*when you hear ringing at the other end)*

C.4 Operating Problems

C.4.1 Cannot Communicate with Remote Host (IP only)

Possible cause—This problem could be caused for a variety of reasons.

Suggestions—The suggestions offered next refer to particular nodes as:

- *local node*—the network node from which you are originating communication.
- *local Router*—the Router on the same Ethernet as the local node.
- *remote Router*—the Router located on the other side of the dialup link, usually at a remote site.
- *remote node*—the network node to which you are attempting to establish communication.

Ethernet Testing

Verify that the local node can communicate with the local Router using the **ping** command.

On the local Router, issue the **ping** command by entering:

`ping` *ip_address_of_local_node*

If the **ping** command completes and displays a round-trip time, proceed to the Dial Test section.

If the **ping** command displays the message

```
Target did not respond
```

perform the following steps:

1. Verify that the Ethernet cables on both the local node and the local Router are securely connected.
2. Make sure that the subnet masks on the local node and the local Router match. Also verify that the (sub)network number of the local node and the local Router match. Display this information using the **ifconfig** command.
3. Issue the **icmp status** command. Note the count of icmplnEchoReps and icmpOutEchos packets displayed.
4. Try the **ping** command again using the **-s** option:

   `ping -s` *ip_address_of local_node*

5. This **ping** command continuously sends inquiries to reach the *local_node*. While the **ping** command is executing, watch the network activity LEDs to verify that the Router is sending datagrams out the Ethernet interface. Stop the **ping -s** command by entering <Ctrl-c> or by pressing <RETURN>.
6. Issue the **icmp status** command again. Determine if the count for *icmplnEchoReps* and *icmpOutEchos* increased. If the count for *icmpOutEchos* increased, and the *icmplnEchoReps* count did not increase, it implies that the Router is sending the reachability messages to the local node and not receiving a response from the local node.
7. Issue the **arp** command to display the contents of the Router Address Resolution Protocol table. This table contains IP to Ethernet Address mappings. Determine if a mapping exists for the local node. The mapping should contain the IP address of the local node and the Ethernet address of the local node.
8. If there is not a valid ARP entry for local node, try issuing the **ping** command to another host on the (sub)network that supports TCP/IP. If this works, try issuing the **ping** command between the other host and the local node, if **ping** is available. Enter the **ping** command from the other host to the local node. If this works, it indicates that the local node is capable of responding to ICMP Echo Requests, but for some reason will not do so for the local Router. If possible, use a network analyzer to trace datagrams traveling between the local node and the local Router. If you continue to experience the problem, Call Technical Support for additional help.

Dialup Communication Testing

Approach 1

Once you have verified that the local node can communicate with the local Router, try establishing a dialup connection from the local Router to the remote Router.

Issue the following command from the local Router:

`ping` *ip_address of remote_Router*

The response is:

```
Target did not respond
```

This occurs because the amount of time to required to establish the connection is longer than the timeout of the **ping** command. After issuing the **ping** command, you should hear the modem dial and connect with the modem at the remote site. If you hear the modem dial, skip to Approach 2, otherwise continue immediately below.

1. Verify that the phone cable is attached to the appropriate modem interface on the local Router.
2. Check the routing table on the local Router using the **route** command. The routing table should contain an entry with the Destination field specified as the (sub)network on which the remote Router resides. Make sure that the Bits field in the routing table entry matches the number of significant contiguous bits to be used as a subnet mask for the remote site.

   Make sure that the *Interface* field in the routing table is specified as *modemX*, where X is the appropriate modem designation number. Make sure that the phone cable is connected to the modem port, shown in the Interface field of the route entry.
3. Issue the **dialup status** command. Verify that the correct phone number for the remote site is displayed. To determine if the dialer is configured as required, refer to *Section 2.9*, **dialup**, in the *Reference Manual*, which begins on page 137, for a description of possible dialer modes: demand, demand backoff, inactive, incoming, once, or keepup.

   Determine the connection status: idle, dialing, listening, serving call, called out. For possible modem states, refer also to *Section B.5* in the *Reference Manual*, which begins on page 137.
4. To display PPP information, issue the **ppp modemX** command, where X is the appropriate modem designation number. Determine if any PPP packets have been sent on the link.
5. Issue the **asystat** command to see transmit and receive statistics for the appropriate modem interface. Also, refer to *Section 2.3*, **asystat**, in the *Reference Manual*, which begins on page 137.
6. Issue the **tip** command to use the appropriate modem interface manually. Refer to *Section B.4.1* in the *Reference Manual*.
7. If you have taken the steps above and are still unable to determine why the modem is not dialing, call Technical Support.

Approach 2

If in Approach 1 above, you heard the modem dial, wait approximately 45 to 60 seconds and try the **ping** command again.

If the **ping** command displays a round-trip time, this implies that you are able to make a dialup connection between the local and remote Routers but the communication between the local and remote nodes is failing. To determine the reason for the failure, skip to Approach 3.

If you are unable to establish a dialup connection between the local and remote Routers, continue with the procedures immediately below.

1. Try the **ping** command again, listening carefully to the modem as it dials. If you hear a busy signal when the other end connects, try dialing the phone number of the remote site by hand using a standard telephone. If you receive a busy signal, there is a problem at the remote site that must be addressed.

2. Issue the **dialup status** command. Verify that the correct phone number for the other site is displayed. To determine if the dialer is configured as required, refer to *Section 2.9*, **dialup**, in the *Reference Manual*, which begins on page 137, for a description of possible dialer modes: demand, demand backoff, inactive, incoming, once, or keepup.

   Determine the connection status: idle, dialing, listening, serving call, or called out. For possible modem states, also refer to the *Modem Control Signals* discussion in the *Modem Dialing chapter* of the *Reference Manual*, which begins on page 137.

3. If you don't hear a busy signal, it may be necessary to check the configuration of the remote Router. If possible, log in to the remote Router over the Ethernet or on the console and enter the **route** command to check the routing table. The routing table on the remote Router should contain an entry with the Destination field specified as the (sub)network on which the local Router resides.

   Verify that the Bits field in the routing table entry matches the number of significant contiguous bits to be used as a subnet mask for the local site. Make sure that the *Interface* field in the routing table is specified as *modemX*, where X is the appropriate modem designation number. Make sure that the phone cable is connected to the modem shown in the *Interface* field of the route entry.

4. If possible, execute the procedures described in Approach 1 above on both the local and remote Router.

5. To display PPP information, issue the **ppp modemX** command, where X is the appropriate modem designation number. Make sure that the first line displayed after this command is:

   ```
   Network Protocol Phase (open for XX:XX:XX:XX)
   ```

   This means that the system names and link passwords are correct on both systems. If you see anything else, make sure that both systems are configured in each other's name and password (using the **config modify** command).

   Determine if any PPP packets have been sent on the link. For more information, refer to *Section 2.18,* **ppp**, in the *Reference Manual*, which begins on page 137.

6. Issue the **asystat** command to see transmit and receive statistics for the appropriate modem interface. Refer to *Section 2.3,* **asystat**, in the *Reference Manual*.

7. Issue the **tip** command to manually use the appropriate modem interface. Refer to *Section B.4.1* in the *Reference Manual*.

8. If you have taken the steps above and are still unable to determine why the connection is not being established, call Technical Support.

Approach 3

If in Approach 2 you were able to establish a dialup connection between the local and remote Routers, but are unable to send data between the local node and the remote node, continue immediately with the following steps:

1. Make sure that the subnetmask and the (sub)network number on the local node and the local Router match. Also verify that the subnetmask and the (sub)network number on the remote node and the remote Router match. Display this information using the **ifconfig** command.

2. Verify that both the local node and remote node contain appropriate routing information. The local node must contain a route that is used to determine how to reach the remote node. Similarly, the remote node must contain a route that is used to determine how to reach the local node. Different TCP/IP implementations have differing methods for managing routes. Most UNIX machines implement the **route** command to add routes and the **netstat** command to display routes. Check in the system administration guide for your TCMP implementation to determine how to manage routes.

3. Determine if you are running RIP on the local and remote Routers. Use the **config show** command on each Router to see if the **start rip** and **ifconfig** *iface* **rip active** commands are present in the configuration, or issue the **rip status** command to determine if any RIP packets have been transmitted or received by the Routers. If RIP is enabled in either or both Routers, temporarily disable RIP by entering the **stop rip** and **ifconfig** *iface* **rip off** commands.

   Enter the **route -f** command to flush the routing table of all routes learned by RIP. Do this on both Routers if necessary. If you changed any RIP configuration try issuing the **ping** command again. Wait approximately 45 to 60 seconds and try it a second time. If the remote and local nodes are now able to communicate, there is a routing problem caused by RIP. If you are unsure of how RIP should be configured, call Technical Support. If the local and remote nodes are still unable to communicate, continue below.

4. Determine if RIP is running on the local and remote nodes. If so, try disabling it and flushing the routing tables on the local and remote nodes of all routing table entries learned by RIP. See the system administration manual for your system to determine how this should be done. After disabling RIP and flushing the routing tables, try issuing the **ping** command again. Wait approximately 45 to 60 seconds and try it a second time. lf the remote and local nodes are now able to communicate, there is a routing problem caused by RIP. lf you are unsure of how RIP should be configured, call Technical Support.

   To configure routing on the local node, add one of these three types of routes to the local node's routing table:

- host route to the remote node
- subnetwork route to the remote (sub)network to which the remote node belongs
- default route

For a host route, the destination address should be designated as the IP address of the remote node. The next hop or gateway should be specified as the IP address of the local Router. The subnet mask, if supported, should be specified as 255.255.255.255 or 32 bits.

For a (sub)network route, the destination address should be specified as the (sub)network number of the remote node. The next hop or gateway should be specified as the IP address of the local Router. The subnet mask, if supported, should be specified as the subnet mask or corresponding number of significant contiguous bits of the remote (sub)network.

For a default route, the next hop or gateway should be specified as the IP address of the local Router.

To configure routing on the remote node, add one of the following three types of routes to the remote node's routing table:

- host route to the local node
- subnetwork route to the remote (sub)network to which the local node belongs
- default route

For a host route, the destination address should be designated as the IP address of the local node. The next hop or gateway should be specified as the IP address of the remote Router. The subnet mask, if supported, should be specified as 255.255.255.255 or 32 bits.

For a (sub)network route, the destination address should be specified as the (sub)network number of the local node. The next hop or gateway should be specified as the IP address of the remote Router. The subnet mask, if supported, should be specified as the mask or corresponding number of significant contiguous bits of the local (sub)network.

For a default route, the next hop or gateway should be specified as the IP address of the remote Router.

5. After all of the routing information has been configured, try pinging the remote node again. lf you hear the modem dial, wait approximately 45 to 60 seconds and try the **ping** command one more time. If you are still unable to establish communications between the local and remote nodes, contact Technical Support.

C.4.2 Connection Drops After a Few Seconds

The Router connects properly then drops the line after a few seconds.

Possible cause—CHAP failure

Suggestion—Turn syslog on and try to connect. Normally the syslog messages will give a good indication of the problem.

For example, the names of Routers (Router1 and Router2) are just as important as the passwords. Look at the password files from both Routers to determine if the names or passwords are correct. Refer to the examples in **Section A.1.1**.

C.4.3 Connection Drops after a Few Hours

The Router continually drops the modem link after a few hours of operating properly.

Possible causes—The quota is set too low and forces the line down, or the Router is not in keepup mode.

Suggestion—Check the settings by entering the command:

```
dialup modem0 status
```

For example,

```
(tcp/ip) Router> dialup modem0 status
modem0: (28800/V1.lOOA-V34_DP)
DTR On RTS On CTS On DSR On RI Off DCD Off
keepup Called out   Timeout: 240   Idle: 0:00:00:08
Remote phone: 1918055623180
Dailyquota:l:00:00:00 Used:00:00:00:00 Left:1:00:00:00
Usage warning currently set at: 0:02:00:00
```

Also refer to dialup in *Appendix A* of the *Reference Manual.*

C.4.4 Constant Remote Dialup

The modem link dials up a remote location all the time.

Possible causes—Some network process is causing the Router to dial remotely.

Suggestion—Check the dialup modem0 dial_log to see which address on the network is causing the dialing.

`time:` *interface*`Dialing  from:` *address* `to:` *address (protocol)*

This indicates the source of the traffic that is causing the dial. Also refer to **Appendix B**.

C.4.5 Unable to Attach to a Remote NetWare Server (Modems only)

Possible cause #1—The network cabling is not configured correctly.

Suggestions—Verify that the phone line is connected correctly in the Router. Make sure that the phone line on each of the Routers is connected to the jack labeled LINE.

Issue the IPX mode command **update now**. This should cause the modem to dial.

If you hear the local Router modem dial but the modems do not connect (use the **dialup modemX status** command to see if the connection is established), try disconnecting the phone line from the Router, connecting it to a normal phone, and placing the call.

Determine if the modem at the other end of the connection answers. If it answers, verify that the number that you called is the same as the configured phone number using the dialup modemX status command on the local Router. If it does not answer, verify that you're using the correct phone number and check the Router at the other end to ensure that it is cabled and configured correctly.

Verify that the Ethernet cable is connected to the appropriate Router network connector.

Possible cause #2—The Router is not dialing the phone when a connection is requested, because it has not learned about the services available on the network attached through its modem connection.

Suggestions—Issue the IPX mode command, **update now**. If a modem connection is not already established, this command should cause the Router to dial. Use the IPX mode **sap** command to determine if the service and server name that you require is listed in the display. If it is not, the Router is not learning about the services on the remote network. This could be caused by a misconfigured network. Refer to the section about misconfigured networks.

If the service that you require is listed in the SAP display, ensure that the appropriate route to the service exists using the IPX mode **route** command. For example, if the SAP table displays the service and server you require as:

```
Name      Type              Interface  Address               Hops  Flg

JUSTIN    FILE SERVERmodem0     10.000000000001.451    2     P
```

The IPX modem route command must have a route to network 10 in order to reach the ENG File Server. It should look something like:

```
          Network     Interface  Router/Next      Hops Ticks Timer      Flags

JUSTIN    00000010    modem0     74011f159a4b     3    13    20         P
```

If you do not have such a route, the problem may be caused by a misconfigured network. Refer to the **Section C.4.8**.

C.4.6 Remote Server Not Found (IPX)

The NetWare client displays the following message when trying to connect to a remote server through the Router:

```
SHELL-XXX-XX:  a network server could not be found
```

Possible cause—The local Router has not learned about the services available on the remote network. See the *Possible cause #2* described in the previous problem titled Unable to attach to a remote NetWare server giving you suggestions about what to do when you attach to a remote NetWare server.

C.4.7 No Connection Slots Available (IPX)

The NetWare client displays a message similar to the following message when trying to connect to a remote server through the Router:

```
SHELL-XXX-XX:  no connection slots available
```

Possible cause #1—The limit on the amount of connection slots available on the NetWare server has been reached. Check the server to see if the maximum number of users is currently logged in. lf the limit has been reached, then there are no available slots. In this case, the problem is not caused by the Router.

Possible cause #2—This could be caused by a misconfigured network. Refer to the section below on misconfigured network.

C.4.8 Misconfigured Networks (IPX)

Suggestion—Check your network configuration to be sure the following items are configured correctly:

```
NetWare Server1
ipx internal net 1234
bind ipx to ether_board net=00001111

Router 1
(ipx)Router1> ifconfig eth0
eth0/802.3 Lan mode Network number 00001111 (up,connected)
Node number 02CFlF800219
flags 000722 trace 0x0000
sent: ipx 20471 tot 80500 idle 0:00:00:00 qlen 0
recv: ipx 151265 tot 570065 idle 0:00:00:00
discarded input 3396 discarded output 0
input q len 10 output q len 10

NetWare Server2
ipx internal net 5678
bind ipx to ether_board net=00002222

Router 2
(ipx)Router2> ifconfig eth0
eth0/802.3 Lan mode
Network number 00002222 (up,connected)
Node number 02CFlF800436
flags 000722 trace 0x0000
sent: ipx 20231 tot 80760 idle 0:00:00:00 qlen 0
recv: ipx 151265 tot 570065 idle 0:00:00:00
discarded input 3396 discarded output 0
input q len 10 output q len 10
```

Ethernet frame types—Make sure the frame type(s) configured on each Router match the frame type(s) in use on the NetWare clients and servers on the LAN.

IPX network numbers—Make sure that a unique IPX network number is configured on the Router for each Ethernet frame type in use on the LAN. Make sure that the IPX Network Numbers configured on each Router match those configured on each NetWare server. Note: IPX Network Numbers do not have to be configured on NetWare clients.

Internal network numbers—Make sure that unique Internal Network Numbers are assigned on each NetWare server throughout your network.

Console messages—Check your NetWare Server console for messages indicating that the IPX Network Numbers are set incorrectly. The messages on the server console give the Ethernet address of misconfigured network nodes.

C.5 Client Problems

For more troubleshooting tips concerning client connectivity problems, refer also to the *Reference Manual*.

C.5.1 Router Does Not Answer When Client Calls

Possible cause—Client is dialing the wrong number or not using the correct modem.

Suggestions—Bring up the **ro** utility (Remote Office). Pull down the **Connection** menu and select "Login to Router." Look at the Phone Number line and verify the phone number. lf possible, dial that number and make sure that a modem (on the Router) answers the phone.

Try to dial in again, and make sure that your client machine dials the Router. Look at the top half of the Login Status screen to see modem status information. Make sure that the modem string is transmitted to the modem. You should see a string of the form "ATDT" followed by the phone number that you entered for the client. lf the modem is unable to dial, make sure that the correct com port has been selected for dialing, by looking at the "Login to Router Port" line.

C.5.2 Router Answers Client Call But Connection Fails

Possible cause #1—Bad login name or password. Account is disabled.

Suggestion—Look at the bottom half of the Login Status Window on your Async Client software. lf the login name is incorrect, you will see the message:

```
Login Failed: Invalid user name
```

If your password is incorrect, you will see the message:

```
Login Failed: Bad Password
```

In either case, reenter the user name and password on your Login phonebook record and try again. If either of these messages occur, correct the account entry on the Router. Log in to your Router, and enter the client list command. Now verify the name of your client account and that the client account is enabled.

C.5.3 Client Logged In, But Can't Access Servers on Network

Possible cause—Not configured for the correct protocol. IP address not configured.

Suggestion—If you have access to your Router console, enter the **who** command. Verify that you are logged in and have a nonzero address for the protocols that you wish to use.

Bring up the *ro* utility (Remote Office), pull down the **connection** menu and select the "**port status**" line. The next screen that appears will show all of the protocol information for your connection. On the lower half of the screen, your IPX and IP addresses should appear.

If you are using IPX, your Remote IPX Network Number should be nonzero. lf you are using IP, your local and remote IP addresses should also be nonzero.

If your IP or IPX addresses are missing from the window, you may have failed to configure your client for the correct protocol. Edit your phonebook record; choose the *MORE* button at the bottom of the screen and verify that you have selected the correct combination of protocols. If you are also using IP, and your IP address was 0.0.0.0, select the *PROTOCOL* button and verify that you have a nonzero IP address.

C.6 Returning Your Router for Repair

There are no user-serviceable parts inside the Router.

If your Router fails to boot, contact technical support. If factory service is required, we will give you a Return Merchandise Authorization (RMA) number. Include this number when returning the item for service, and please reference it on any correspondence.

If possible, use the original packing materials to ship the Router. If the original packing carton and packing materials are not available, package the unit securely in a container equivalent to the original and insure the package to protect it against loss or damage.

WARNING

Your Router contains a lithium battery that is not in an accessible area. Do not attempt to replace it yourself. The battery could explode if you replace it incorrectly. It must be replaced only by qualified service personnel, and only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Appendix D: Interoperability

Routers can interoperate with multiple routers from multiple vendors in a coordinated manner. Use the instructions in this appendix to provide interoperability with:

- RADIUS servers
- SecurID servers
- Cisco routers
- IPX synchronous routers (Sync Router only)
- TCP/IP synchronous routers
- CSUs/DSUs (Sync Router only)

D.1 RADIUS Servers

RADIUS is a protocol that allows multiple devices (like the Router) to access a single server for authentication, authorization, and configuration information. This allows all names and passwords to be administered from a single point, greatly simplifying the task in environments where many devices are on the network.

RADIUS server software that executes on a UNIX host is available without charge. Source code is available from:

Livingston Enterprises at
ftp://ftp.livingston.com/pub/livingston/radius-1.16.tar.Z

or **Merit®** at:
ftp://merit.edu/pub/michnet/radius.1.17.tar.Z

The Router has been tested with both of these types of RADIUS servers. If you have not previously run RADIUS, you should obtain a new copy of the software and compile it for your system, and follow its provided instructions.

The RADIUS documentation from Merit and Livingston refers to a Network Access Server (NAS). NAS is a generic term for a dial-in router.

Configuration

To use RADIUS to authenticate clients connecting to the Router, perform the following configuration steps:

1. Configure the RADIUS server to accept queries from the Router. To do this, add the Router's name (or IP address) and password to the clients file on the RADIUS server.

For the Livingston RADIUS server, the default location of this file is */etc/raddb/clients*. For the Merit RADIUS server, the default location of this file is */usr/private/etc/raddb*.

2. Set the authentication method on the Router to RADIUS, and provide the name of the RADIUS server to the Router. To do this use config, or use the following commands.

authent method radius
authent add server *hostname_RADIUS_server*
<a password will be requested here>
config save

3. Verify that the desired Router modem port(s) on the Router is in client mode:

   Enter the command **dialup** *iface* status. For example

   dialup modem0 status

   On the resulting display, verify that the first word of the third line is "client." Other values that might appear are "inactive," "demand" and "demand_backoff." If it does not say "client," run **config** to set this interface to a client, or enter the following command:

   dialup *iface* **client**

4. Turn on authentication within PPP using one set of the following commands.

   ppp *iface lcp local auth pap*
   config save

   or

   ppp *iface* **lcp local auth chap**
   config save

5. If necessary, add clients to the RADIUS database. On your RADIUS server, verify that the file */etc/raddb/clients* (or */usr/private/etc/raddb/clients*) has an entry for each client.

6. Test the configuration for a specific client. Use the **authenticate test** subcommand to verify that a client and its password are valid in the current Router configuration. On the Router, enter

   authenticate test *clientname*

   Provide the password when prompted.

D.2 SecurID Servers

SecurID is a security and authentication system that has two elements. Each user carries a card and also memorizes a password or Personal Identification Number (PIN). To log on, the user must type his or her name, and then enter a passcode consisting of the PIN followed by the number currently displayed on the card. The displayed number changes randomly once every minute. The SecurID server software is called the ACE (Access Control/Encryption) server.

The Router will interoperate with the SecurID authentication scheme over the modem interface only (at this time).

ACE server software and user cards must be purchased from Security Dynamics. For detailed information about how to install and configure the ACE server, contact Security Dynamics.

After the ACE software is installed, follow the next set of instructions to configure the ACE server and the Router to support the SecurID scheme.

Configuration

As part of setting the authentication method to SecurID, a successful authentication of a client must take place between the Router and the ACE server. Therefore, a fully operable ACE server must be available and correctly configured for use with the Router before configuring the Router to use SecurID. To accomplish this refer to the following instructions below. Note that the most current information will be with your ACE server software package.

1. Set up the ACE server following the instructions supplied by Security Dynamics. If you are already running the ACE server, add the Router to the list of clients by running sdadmin and choosing item Clients, and then item Create Client. Type the name of the Router and specify its type as Comm Server.

2. At the ACE server, either activate users who will log onto the Router as direct users, or activate a group of users. To activate a user, from the main menu choose item Clients, and then choose item Activate Direct Users. Now type the name of the Router, and then enter the Serial Number or User Name information as requested. Refer to the ACE server documentation for more information about using groups.

3. Using ftp, copy the file */var/ace/sdconf.rec* from the ACE server to the Router.

   From the ACE server, log into the Router as root. Be sure to use binary mode for the transfer.

   % **cd /var/ace**

   % **ftp** *Router*

   Name: **root**

   Password: *root_password*

   > **bin**

   > **put sdconf.rec**

   > **quit**

On the Router, verify that the file *sdconf.rec* resides at the top level of the directory hierarchy.

4. Have your SecurID card available, with it already configured for use with this Router at the ACE server.

5. To verify that the Router can communicate with the ACE server. On the Router, enter:

   ping *hostname*

   where hostname is the name of the ACE server.

6. On the Router, enter:

   config modify

   Eventually you will be asked to select an authentication method. Select SecurID. At the end of the config session (after you have been asked whether you want to save this configuration), you will be prompted to enter your username and passcode.

   If the ACE server authenticates you, the authentication method is now set to SecurID. If the ACE server fails to authenticate you, you will be given the option to try again or give up (authentication method stays unchanged).

If authentication fails unexpectedly, go to the ACE server and run **sdadmin**. Choose the menu item **Activity Report** and look at the last two pages of the report for reasons why the login attempt has failed. This report can give you clues as to what corrections need to be made to allow the authentication method to be set to SecurID.

7. Verify that the desired modem port(s) on the Router are in client mode. From the Router, enter

   dialup *iface* **status**

   For example, dialup modem0 status.

   On the resulting display, verify that the first word of the third line is "client." Other values that might appear are "inactive," "demand," and "demand_backoff." If it does not say "client," run **config** to set this interface to a client, or enter the following command from the Router:

   dialup *iface* **client**

   config save

8. Make sure that the login prompt is enabled for dial-in users. From the Router, enter:

   dialup *iface* **logprompt on**
   config save

9. Test the configuration. From the Router, enter:

   authent test *clientname*

Starting from the beginning

If something goes wrong in the SecurID configuration, it may be necessary to start from the beginning:

1. Remove the **sdconf.rec** and **sdstatus.net** files from the Router boot diskette.

   This can be done either by taking the Router boot diskette to a DOS machine, running Stacker, and then deleting the files in DOS, or by using ftp from a networked machine (using the "delete" command to remove these files).

2. Use **ftp** in binary mode (bin) to copy a new version of **/var/ace/sdconf.rec** from the ACE server to the Router's **\sdconf.rec**.

3. On the ACE server, run **sdadmin**. Choose the item **clients** and then choose the item **Re-initialize client**. Enter the name of the Router when prompted.

4. On the Router, enter the command

   authent method local

5. On the Router, now run config modify, and redo the SecurID configuration.

D.3 Cisco Router Interoperability

For Cisco routers to successfully interoperate with our Routers, configure the Cisco routers depending upon the method of connection (Ethernet, synchronous line, or dialup connection), and possibly use a customized dialer script for the Router. You should possess a general familiarity with Cisco routers and their command language.

Because of the complexity involved with Cisco routers, step-by-step instructions are not provided, so use this information as a guideline.

This section describes interoperability considerations for:

- Ethernet connections between Cisco routers and our Routers
- Synchronous lines between Cisco routers and our Routers
- Dialup connections between Cisco router and our Routers

D.3.1 About the Cisco Command Language

The Cisco command language has several different modes:

- non-privileged user mode
- privilegedusermode
- global configure mode
- configure interface mode
- configure line mode

Table D-1. Cisco Command Language Modes and Their Uses.

mode	prompt*	how to enter mode	Notes
non-privileged user	*bing*>	default mode	Very few commands are legal—most are variations of the *show* command. Type ? for a list of valid commands.
privileged user	*bing*#	From non-privileged user mode, enter the **enable** command.	Type ? for a list of valid commands.
global configure	*bing*(config)#	From privileged user mode, enter the **configure** command, then select **terminal** as the source of configuration commands.	There is no help available. Configuration statements entered will be checked for syntax and held until you are finished with configuration mode (by entering CTRL+Z).
configure interface	*bing*(config-if)#	From global configure mode, enter **interface** *type number*	There is no help available. Configuration statements entered will be checked for syntax and held until you are finished with configuration mode (by entering CTRL+Z).
configure line	*bing*(config-line)#	From any configure mode, enter **line** *number*	There is no help available. Configuration statements entered will be checked for syntax and held until you are finished with configuration mode (by entering CTRL+Z).

*bing is the name assigned to the Cisco router.

Also refer to Cisco's technical documentation.

D.3.2 Types of Connections Available

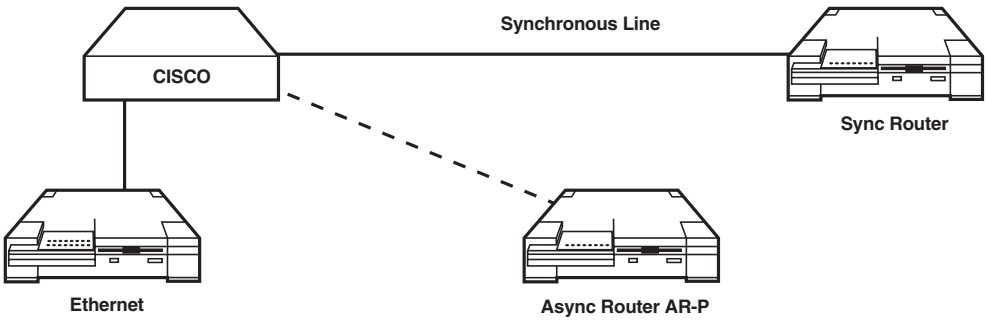

Figure D-1. Cisco and Router Connection Methods.

Routers may be connected to Cisco routers using:

- an Ethernet connection
- a synchronous line
- a dialup connection

Ethernet Connection (Cisco to Router)

Routers and Cisco routers can easily share an Ethernet connection. Cisco routers use the IGRP protocol to exchange routing information with other routers. In order for a Cisco router to learn routes from the Router, **both the Cisco router and the Router must have RIP enabled**.

To enable RIP on the Cisco router, log into the Cisco router and issue the following commands to change from Cisco's global configure mode:

```
[configure]
router rip
network x.x.x.x
neighbor y.y.y.y
passive-interface ethernet 0
```

Specify the Router's Ethernet address in a neighbor statement in the *router rip* section.

In IP and IPX networks, the Router enables RIP by default.

Synchronous line (Cisco to Router)

This information only applies to the Sync Router.

The default encapsulation protocol for a synchronous Cisco port is not the PPP protocol. For the synchronous Cisco port, set the encapsulation protocol to PPP. On the Cisco router, configure the port as follows:

```
configure
interface serial 0
ip address w.w.w.w m.m.m.m
encapsulation ppp
```

Where *w.w.w.w* is the IP address number and *m.m.m.m* is the mask number.

Our Routers usually use the IP address of their Ethernet port for all interfaces (modem, sync), while Cisco routers are usually configured with distinct IP addresses for each interface port.

If you prefer not to use distinct IP addresses for each interface port on a Cisco router, replace the IP address statement above ("ip address *w.w.w.w m.m.m.m*") with:

```
ip unnumbered ethernet 0
```

Many network managers don't like to do this, because on a Cisco router, an unnumbered link becomes unusable, if the interface from which it obtained its IP address experiences a failure.

Dialup connection (Cisco to Router)

Cisco routers generally have two asynchronous ports labeled "CONSOLE" and "AUX." The CONSOLE port (DCE) is intended to connect to an asynchronous terminal. The AUX connector (DTE) can be connected to a V.35 bis or V.34 modem.

With Cisco routing software release 10, the AUX port can be used for dial-in or dial-out (DDR = Demand Dialed Routing) access, which is compatible with our Router.

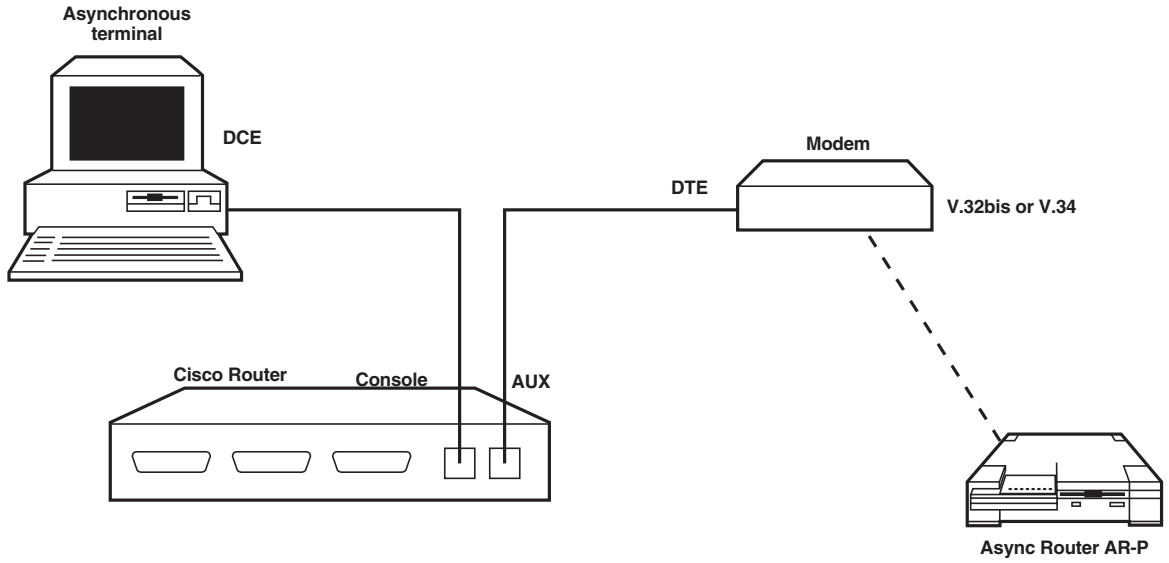

Figure D-2. Dialup Connection (Cicso to Router).

To enable a Router to dial into a Cisco router, on the Cisco router:

1. Configure the physical line parameters, using the *configure* line command.

```
configure
line aux 0
login local
modem inout
speed 38400
flowcontrol hardware
```

This configures the AUX port to be in a mode capable of supporting a modem for incoming and/or outgoing calls, with a port speed allowing modem compression. The highest speed supported is 38,400 bps.

The [configure line] command **login local** tells the Cisco router to use its own table of user names and passwords to validate the login. Alternatively, you can have a password for each line (no user name), or use a nearby TACACS server for validation.

2. Configure a *username/password* pair for logging in on the line:

```
[configure]
username xxxxx password yyyyy
```

3. Define the interface (logical port):

```
[configure]
interface async 1
ip address w.w.w.w m.m.m.m
encapsulation ppp
async default ip address b.b.b.b
async mode interactive
ppp authentication chap
```

Where *w.w.w.w* is the IP address (Cisco), *m.m.m.m* is the mask number (Cisco), and *b.b.b.b* is the IP address (Router).

You can use the same username/password for CHAP validation, that you used to log in.

4. Choose between show and other non-privileged troubleshooting commands displayed when you enter "?," or enter PPP using the command:

```
ppp default /routing /compress.
```

This combination of options is comfortable for most network managers. When you dial into the port, you are prompted with:

```
User Access Verification
Username: xxxxx
Password:
Router>
```

Alternatively, you can block access to the command prompt by selecting *async mode dedicated*. You can even drop straight into PPP when the modem answers.We have found that access to the command prompt is valuable for debugging after the initial configuration, and that it is easy to write a login script to issue the "ppp" command. Refer to the sample login script provided after the next section.

Dialing Out (Cisco to Modem to Router)

Dialup PPP support for Cisco's asynchronous AUX port is a fairly new feature, and most Cisco owners aren't familiar with it.

The following configuration statements were taken from a working configuration. To fully understand each statement, we recommend familiarizing yourself with the Cisco commands, using the Cisco technical documentation.

Dialing out is more difficult than dialing in, because first you must enable IP packet filtering. To enable IP packet filtering, on the Cisco router:

1. Define a dummy filter that allows everything:

```
configure
access-list 101 permit any
dialer-list 1 protocol ip permit
```

2. Define a dialer chat script to place calls to the Router. The following command will work with almost any V.34 modem, and must be entered on a single line:

```
[configure]
chat-script dial-v34 ABORT ERROR ABORT BUSY "" ATZ
OK "ATDT \T" TIMEOUT 60 CONNECT \c
```

The first two argument pairs indicate that if ERROR or BUSY messages are posted from the modem side, dialing must be abandoned and restarted on the next triggering event. More such keywords can be added.

The following are pairs of *expect this* and then *send this*:

\T—means *insert the telephone number here.*

\c—an end-of-script marker which means *don't send anything at this point.*

" " sends a carriage return.

3. The line and interface definitions are similar to dial-in, but with the triggers for dialing out added:

```
[configure]
username xxxxx password yyyyy
line aux 0
login local
modem inout speed
38400 flowcontrol hardware
access-class 101 out
script dialer dial-v34
interface async 1
ip address a.a.a.a m.m.m.m
encapsulation ppp
async default ip address b.b.b.b
async mode interactive
ppp authentication chap
dialer in-band
dialer string 555-1234
dialer group 1
```

where *a.a.a.a* is the IP address number (Cisco), *m.m.m.m* is the mask number (Cisco), *b.b.b.b* is the IP address (Router), and 555-l234 is the phone number (Router).

Cisco dialer script for Router

Because almost everything can be customized, the following Router dialer script is not guaranteed to work for everyone. However, the following Router dialer script has been tested for dialing into a Cisco system with the previous configuration (Step 3).

Create this dialer script in an ASCII file and copy it to the Router boot diskette. Use the **dialup script** command to configure your Router to use this dialing script.

```
# CISCO.DCF
send "AT\r"
wait 1000 "OK"
send $PHONE
connect
send "\r\r" 100
wait 10000 "Username:"
send $LOGIN_NAME
wait 1000 "Password:"
send $LOGIN_PWD
send "ppp\r"
wait 2000 "MTU is 1500 bytes"
status up
```

D.4 IPX Synchronous Routers

This information only applies to the Sync Router.

When connecting a Router to multiprotocol routers from other vendors, we recommend running the synchronous links in standard PPP mode (called IPXCP).

D.5 TCP/IP Synchronous Routers

D.5.1 Configure Router to Use PPP

Although each type of router may have a preferred, proprietary link encapsulation method, they all allow PPP as an alternative, so consider using PPP. Refer to your router's documentation to find the exact command to select PPP encapsulation.

D.5.2 Configure Router to Use RIP

Each type of router also has a preferred internal routing protocol, such as IGRP or OSPF, but they all allow using RIP as an alternative on a specific network. Again, refer to your vendor's documentation to find the exact command to configure the router for RIP.

D.5.3 Assign Subnet to PPP Connection if Necessary

The Router doesn't require you to assign a subnet number to the PPP connection between two routers (via modem or leased line), although some routers do. If you want to connect to a router that requires you to assign a subnet number to the PPP connection, then on the Router:

1. Assign a subnet number for the link between the two routers. On the Router, use the *ifconfig sync0 address/bits up* command.
2. Configure the Router to use the other router's address (on that link) as the remote IP address.
3. Complete the Router configuration process.
4. Save the Router's configuration.

Some routers (such as Wellfleet®) may require you to explicitly insert the remote node's IP address in an "adjacent host" table.

D.5.4 Telebit NetBlazer and PN

If you are connecting a Router to a Telebit NetBlazer or PN (Personal Node) router, and have enabled IPX routing in both systems, you must disable PPP IPXCP compression, because the Router currently doesn't interoperate with the NetBlazer's IPXCP compression.

To disable PPP IPXCP compression, issue the following command to the Telebit Netblazer or PN:

```
ppp
options interface ipxcp compress off
```

and then save the configuration by entering:

```
save
```

D.6 Interoperability with CSU/DSUs

This information only applies to the Sync Router.

This section shows how to configure CSUs (channel service units) and DSUs (digital service units) for use with the Sync Router. Recommended switch settings are intended only for interoperation with the Sync Router. The CSU/DSUs are listed alphabetically.

D.6.1 Black Box® CSU/DSU MS, EAZY® CSU/DSU MS, ADTRAN DSU III AR

These three CSU/DSUs provide synchronous service over DDS (digital data service), DDSII (DDS secondary channel services), or SW56 (switched-56) lines.

Connect the Sync Router to the Primary V.35 DTE connector. Use the following configuration information when using the front-panel keypad:

Local network options:

LOOP RATE: 56K, no secondary channel
NETWORK TYPE: DDS or SW56

CLOCK SOURCE:	if on a DDS, FROM NETWORK;
or	if on a point-to-point private network,
	set one to MASTER, and the other to FROM NETWORK.

Local DTE options:

DTE rate:	DTE 56K/57.6K
Connector Type:	V.35
Data Format:	SYNCHRONOUS
DTE CMD:	V.25 SYNC
Transmit clock:	NORMAL
CS options:	follow RS
Anti-Stream:	timer OFF
CD options:	normal
TR options:	idle when OFF
SR options:	forced ON

You can configure the dialer and test options if you wish. However, if you are using SW56, the Router will act as a dialer.

D.6.2 ADTRAN ISU 128

The Adtran ISU 128 provides service over a leased digital network. ISDN network termination is built into the ISU 128, eliminating the need for an NT1.

Connect the Sync Router to the V.35 interface, and set the DIP switches to V.35 (both should be UP). Before setting up the equipment, verify your operating mode. The Router Sync+ supports the following:

- for a 64K line: CLEAR CHANNEL SYNC or BONDING SYNC
- for a 56K line: CLEAR CHANNEL SYNC or BONDING SYNC
- for a LEASED 56K: CLEAR CHANNEL SYNC
- for a LEASED 64K: CLEAR CHANNEL SYNC
- BONDING: Bandwidth ON Demand.
- CLEAR CHANNEL: The entire channel (line) is provided to the Sync Router without regard to data format or protocol.

Use the front-panel keypad to configure the ISU 128 as follows:

Network options:

The network options depend upon whether or not you are using a leased line or a SW56. Configure the leased line as a leased line, and configure SW56 as a dial line. If you are using a dial line, contact your service provider to find out the switch type.

- Call Type: Data 56Kbps for SW56
- Dial Options: set to V.25 HDLC
- Auto Answer: ON

DTE options:

- Set to Synchronous
- DTE bit rate: Set to same as NETWORK CALL TYPE (56000 or 64000)
- RTS options: force RTS
- CTS: 1Ms delay
- CD: CD if call up
- DSR: forceDSR
- Transit clock: normal

Protocol options:

- If using a leased line, set to *clear channel.*

D.6.3 CM-1056E, Larse S5600, Racal-Milgo 4556

The CM-1056E, Larse S5600, and Racal-Milgo 4556 are all nearly identical CSU/DSU's, and are used exclusively for leased-line operation. Set the switch settings as follows (the numbers are not given, because they vary from model to model):

Switch Function	Setting
CTS	OFF (follows RTS from DTE)
DTE	OFF
Remote digital loopback	ENABLED
Stream	OFF
RTS	OFF (gets RTS from DTE)
DSR loopback	ON, data during loopback
Circuit assurance	ENABLED
Clocking	internal on one side of the line, external on the other

Before performing any back-to-back testing, obtain a 2-pair (4 wire) RJ-45 cross-over cable, with pin 1 connected to pin 8, and pin 2 connected to pin 7.

If these CSU/DSUs will be used on a public data network (instead of a leased line), set the clocking function to OFF, because the CSU/DSUs will receive their timing from the DDS network.

D.6.4 Motorola TA220/TA220k

The Motorola® TA220s provide service over ISDN lines, but do not provide internal termination, and so require a NT1 connection. The TA220/220k's can be used simultaneously with other ISDN equipment over the same digital line.

Using the V.35 adapter provided with the TA220, connect the Router Sync+ to the RS-232 port #1 on the TA220. Configure the TA220 for V.35 operation.

Using the TA220's front keypad, load the factory-default setting 0. Set the SWITCH CONFIG options, according to the type of service available. Contact your service provider for more information about the switch type.

After loading the factory default, change the PORT CONFIG OPTIONS as specified:

DTE options:

- port 1: SYNCHRONOUS 1
- speed: 56K or 64K
- DTE CMD and MESSAGE OPTIONS: set to V.25 HDLC
- DTE PIN OPTIONS: set DCD to NORMAL PROTOCOL
- OPTIONS: set to NONE or BOND

D.6.5 Other CSU/DSUs

If your DSU/CSU is not any of the models previously listed, use the following generic settings:

- Timing: the line speed being used (56 Kbps, 64 Kbps)
- Synchronous/Asynchronous: Synchronous
- RTS: normal
- DSR: on or forced on

Appendix E: Glossary

ARP—*address resolution protocol.* Provides IP-to-Ethernet address mapping. ARP dynamically binds a high-level IP address to a low-level physical hardware address. ARP is used only across a single physical network and is limited to networks that support broadcasts.

asynchronous—Method of data communication in which transmission is not synchronized by a clocking signal.

asynchronous transfer mode (ATM)—The SONET standard for a packet-switching transfer-mode technique which uses packets (cells) of fixed lengths. Also referred to as "BISDN" and "cell ray."

auto-answer mode—After successful verification of a calling workstation's password, client enters auto-answer mode anticipating a response from the Router.

backbone—The primary connectivity mechanism of a hierarchically distributed system. All systems connected to an intermediate system on the backbone are connected to each other. This does not prevent systems from setting up private arrangements with each other to bypass the backbone for reasons of cost, performance, or security.

back-end—A system that provides services for another system is often referred to as a back-end. In many cases, the term is synonymous with the term "server."

baud—The number of times per second the signal can change on a transmission line. Typically, transmission lines use only two signal states, effectively making the baud rate equal to the number of bits per second that can be transferred.

B channel—A 64-Kbps information-carrying channel that comprises one element of the ISDN technology definition.

BOOTP—*BOOTstrap protocol.* Allows a workstation to obtain its IP address dynamically from a host or file server instead of statically.

boot, boot up—To start a computer. Often used to indicate starting the Router.

bps—*Bits per second.* Modem signal transmissions are measured in bps.

bridge—A device that connects two or more networks and passes packets between them. Bridges normally operate at the physical network level. For example, an Ethernet bridge connects two physical Ethernet cables and forwards packets that are not locally addresses from one cable to the other.

broadcast—Transmitting a packet to all connected nodes on a network.

byte—A binary representation of a data character, usually consisting of 8 bits.

CHAP—*Challenge-handshake authentication protocol* is used to verify the identity of the peer using a 3-way handshake. This is done upon initial link establishment.

CO—*Central office.* The phone-company entity that a WAN interface (modem or sync) connects to.

client—A user who dials into the Router to get access to the network. The client software is the application that facilitates this process.

client access shift—The interval of time a Router allows remote clients to access the LAN attached to the Router. Client access to the Router (and the LAN) is configured relative to the client access shift: access IN (during) the client access shift, access OUT (not during) of the client access shift, and access BOTH in and out (all day) of the client access shift.

client database—The Router client database can store information for a maximum of 100 clients. The client database is manipulated by the **client** command. The database includes: client name, client password, callback phone number, time filter, connect quota, and idle timeout.

connect quota—Each client may have a per-day time quota placed on its access to the network. The per-day usage is not stored in the user database; thus any accumulated usage will be reset to zero if the Router is rebooted. The current dial-out quota is accumulated only on clients configured for security callback. Once a quota has been reached, a syslog message is generated to provide an audit trail of user activity.

CSLIP—*Compressed SLIP*. A variation of SLIP where the IP header information is compressed.

CSU/DSU—*Channel service unit/data service unit*, also known as a *digital modem*. CSU/DSUs are used to connect the Router (and similar devices) to leased lines such as Digital Data Service (DDS) or Switched-56 service.

cycle power—To turn the Router (or other device) off, and then on.

daemon—A UNIX service process analogous to a NetWare NLM or a DOS TSR.

domain—A part of the naming hierarchy of the Internet. A domain consists of a sequence of names or labels separated by periods, referred to as "dots."

DNS—*Domain naming system*. Provides a mechanism for naming resources in such a way that the names are usable in different hosts, networks, protocol families, internets and administrative organizations.

DOS—*Disk operating system*. The operating system used on IBM PCs and clones.

dotted-quad notation—Format for representing a 32-bit IP address consisting of four 8-bit decimal numbers separated by periods.

DTE—*Data terminal equipment*. Normally refers to a console.

dual-stack functionality—Multiple protocols operating on the same client.

dynamic routing—When a client connects or disconnects, the Router adds or deletes a route to the appropriate routing table. For IPX, this allows the route to propagate to other connected networks, when RIP and SAP updates are transmitted. For IP, this will allow clients to communicate to networks through other interfaces.

email—Electronic messages sent between two computers on a LAN or Internet-connected network.

Ethernet—A LAN protocol and physical connection. Connection media may be coaxial or twisted-pair cable.

FTP—File-transfer protocol, used for transferring files between TCP/IP machines. Also known as "ftp."

gopher—A first-generation service designed to hyperlink various Internet service offerings, regardless of their physical location.

hop count—A unit of measure typically equal to traversing a router. Hops are the number of routers between transmitting and receiving host.

routervu—A command enabling the RouterVu feature available on IPX networks that allows you to remotely log into the Router over the LAN without having a console directly attached to the Router.

ICMP—*Internet control message protocol.* (1) A sub-protocol of IP at the network layer, allowing IP to exchange control information with other IP machines. It automatically reports unusual network conditions such as routing errors and network congestion. (2) Automatically reports unusual network conditions such as routing errors and network congestion. ICMP is an adjunct to the internet protocol (IP) and is often used to help diagnose and solve network problems.

idle timeout—Each client may specify the amount of time allowed to elapse without data transmission, before the Router disconnects the line. Once the line is disconnected, the client must re-establish its connection to a server or host computer. The reconnection policy is determined solely by client software.

internet—(1) Physically, a collection of packet switching networks connected by routers along with protocols allowing them to function logically as a single, large, virtual network. (2) The collection of networks and routers, including the ARPANET, MILNET, and NSFnet that uses TCP/IP protocol suite and function as a single, cooperative virtual network. The Internet provides universal connectivity and three levels of network services: unreliable, connectionless packet delivery; reliable full duplex stream delivery; and application-level services like e-mail that build on the first two. The Internet reaches many universities, government research labs, military installations, and commercial enterprises.

internet address—The 32-bit address assigned to hosts participating in the Internet using TCP/IP.

interoperability—The ability of software and hardware to operate on multiple machines from multiple vendors, to communicate meaningfully and in a coordinated manner without the implications of a master-slave relationship.

IP address—A decimal representation of a four-part hexadecimal number. The four parts are separated by dots. Each part has a value between 0 and 255, and the whole defines both a network and a particular IP machine on that network.

IP—*Internet protocol.* Provides routing and communication services that allow messages to be transmitted between nodes on networks. IP also defines the Internet datagram as the unit of information passed across the Internet. Provides the basis for Internet connectionless, best-effort packet delivery service.

IPX—*Internet packet exchange protocol.* The network-layer protocol defined by Novell for use with NetWare.

IPXWAN—*internet packet exchange protocol for WANs.*

LAN—*Local area network.* Consists of interconnected computers in close proximity of one another, not requiring long distance carriers or telephone connections to communicate. The physical-site area is limited by the degradation of signals through the connection media.

login—A process whereas a user or device provides a name and password to gain access to another device. In order to configure a Router, you have to log into it as root, and provide a root password. Once logged on, you have system-administration privileges.

MIB—*Management information base*, used to manage networks as part of SNMP. Specified in RFC-1098.

modem—A receiving and transmitting device used in pairs to transmit data over telephone lines. The modem in the computer transmitting data modulates the digital computer signal to an analog form. When receiving the analog signal, the paired modem in the remote computer demodulates the digital signal out of the received signal and passes it to its computer.

modem port—Characterized by an RJ-11 standard telephone jack outlet and the identification word LINE on the back of the Router.

Mosaic—A WWW browser originally developed by the National Center for Supercomputing Applications (NCSA). Mosaic natively supports group and private annotation for WWW site entries, inline graphics display, and context-dependent fonts. It can be configured to make use of external viewers for everything from GIF images to MPEG movies, including digital stereo sound. Mosaic is an ideal application to access the global Internet. It is distributed as freeware through FTP on the Internet and is available in a commercial package from Spyglass Systems. Many IP applications vendors plan to or already have licensed Mosaic.

NetWare—LAN networking software from Novell.

network—A group of computers physically linked together that can communicate with one another.

NIS—*Network information service*. Sun Microsystems' second generation IP-to-host name mapping scheme. It is similar to DNS.

network number—An identification used to group network nodes. All host on the same LAN share the same network number.

node—A hardware device on a network. PCs, printers, and routers are examples of nodes.

NT-1—An NT-I is a hardware entity that provides an electrical interface between the user equipment and the digital subscriber line.

packet—Term used for a unit of a data transmission envelope. The envelope contains to and from addresses and control codes for handling the data contents.

PAP—*Password authentication protocol*. Provides a simple method for a peer to establish its identity using a 2-way handshake during initial link establishment. PAP is not a robust authentication method. Passwords are sent over the circuit "in the clear"—that is, in text format—and there is no protection from playback.

ping—Packet internet gopher. A command that sends ICMP messages to test the existence of another IP machine. Superior implementations return additional diagnostic information, such as round trip time.

protocol—Rule structure describing communication procedures on a network. Protocols pertain to physical connections and transport level connections.

PPP—*Point-to-point protocol*, as specified in RFC 1661, was derived from the earlier work on serial-line IP (SLIP). PPP is an efficient serial IP connectivity protocol that offers significant advantages over SLIP, such as dynamic option negotiation and the ability tn carry multiple protocols.

PSTN—*Public switched telephone network*: the telecommunications service provider in your area.

rate adaption—The process of adjusting for different ISDN B-channel speeds. Even though ISDN operates at a 64K line speed, many North American long-distance ISDN connections use leased lines that operate at 56K, and the ISDN software must adjust for the different speeds.

RARP—*Reverse address-resolution protocol.* Permits a workstation's logical IP address to be determined by its physical MAC-layer Ethernet or token-ring address. Also known as "reverse address-resolution service."

remote access—Software allowing a remote PC user to attach any file server on the network as though it were a local node. The servers reside on the host side.

remote client—A software package that enables remote personal computers, laptops, and workstations to dial into a Router and access services on the LAN (attached to that Router).

Remote Office—The current remote client package provided with the Async Router AR-5. Remote office enables your PC to become a remote node on a LAN and access services on that LAN (through the Router).

RFC—*Request for comment.* A TCP/IP document available from the Network Information Center.

RIP—*Routing information protocol.* The protocol used by Berkeley 4.3 BSD UNIX systems to exchange routing information among a network of computers. IPX uses a similar protocol of the same name (RIP) to relay routing information. IPX RIP is not compatible with IP RIP.

rlogin—*remote login.* An alternative to Telnet which provides for direct execution of UNIX commands on a host from the client machine's command line.

router—An intelligent device linking two networks together using the same network layer protocol. The router reads destination addresses of packets routed to it, and sends packets to local hosts or other routers.

routing table—A table maintained by the router of destinations and other router addresses quantified by metrics.

SAP—*Service advertising protocol.* Used with IPX, SAP allows nodes that provide services (print and file servers) to advertise to other nodes.

S-Bus—In ISDN basic-rate applications, the S-bus is the 4-wire bus on the user side of the digital subscriber loop, where the user equipment (TEs) is terminated.

SCHAP—*Security CHAP* for the Async Client is used to support security callback. A modem configured for client access attempts to negotiate CHAP, PAP, then SCHAP verification.

security callback—Only available for use with Async clients, the security callback feature requires a client to be located at a specific phone number, in order to gain access to the Router. First the client dials into the Router and is verified. Next, the Router hangs up the line and calls the client back, at the preconfigured callback phone number. Security callback effectively enables the client to shift the cost of the call, from the client to the Router. It also enhances network security by requiring a client to be located at a specific phone number, in order to gain access to the network.

serial terminal—Input device connected to the console port on the Router interface card used for system administration.

SLIP—*Serial-line internet protocol.* Allows IP to operate over serial (dial-up) lines. Requires a relatively high-speed (9.6 Kbps or faster) connection.

SMTP—*Simple mail-transfer protocol.* The Internet standard protocol for transferring electronic-mail messages from one machine to another. SMTP specifies the way in which two mail systems interact and the format of control messages they exchange to transfer mail.

SNMP—*Simple network management protocol.* A protocol used to manage internetworks.

socket—An IP socket is created when an IP port on a host machine makes a connection to an IP port on a client machine. IP sockets are ephemeral by nature. When a standard request port has formed a socket connection to a standard services port, additional requests for access to that port may be denied, retiming the "Socket request denied" error message, which is often seen when attempting connections to popular Internet WWW host sites.

SPID—*Service profile identification*. An additional identification number used along with the local directory number on some North American ISDN lines. This number and its local directory number must be programmed into the ISDN equipment so the equipment can register the numbers with the Central Office ISDN switch whenever they are running.

SPX—*Sequenced packet exchange*. The guaranteed-delivery version of IPX from Novell.

subnet—For routing purposes, IP networks can be divided into logical subnets by using a subnet mask. Values below those of the mask are valid addresses on the subnet.

switched service—Also known as switched-56 service. This is a type of nonleased line.

synchronous—As in synchronous serial lines, refers to a mode of data transmission in which a clock signal (or embedded clock) is used to coordinate sender and receiver.

TA—*terminal adapter*. An end-user device on the ISDN. Used to interface the Router (and similar devices) to an ISDN line. The terminal adapter can be a conversion device to connect a non-lSDN device (analog telephone) to the ISDN.

TCP—*transmission control protocol*. Responsible for packet reception verification, data integrity, packet sequencing and maintaining connections. Provides sequenced and verified transmission of messages between systems. TCP is part of the TCP/IP protocol suite, and often is used to link UNIX-based LANs.

TCP/IP—*transmission control protocol/internet protocol*. A standard for communicating among different computer systems. The computer systems may have different operating systems and hardware.

telnet—A utility that emulates a terminal on a network as though it were a console directly connected to the Router. It enables users to log into a remote system directly from a local terminal and local login session. With telnet, the user can conduct a session and run application programs as if the user's terminal were directly connected to the host. Telnet requires the use of TCP/IP.

transparent access—When a remote device or network appears to be a local node on the LAN.

UDP—*User datagram protocol*, provides for user access to low overhead connectionless datagram communications. UDP is part of the TCP/IP protocol suite.

U Interface—In North America, the U Interface is a reference point between an NT1 and a digital subscriber line.

uudecode—UNIX-to-UNIX decode allows binary files that have been uuencoded into ASCII text files to be translated back into binary files.

uuencode—UNIX-to-UNIX encode allows binary files to be translated into pure ASCII text files, permitting them to be transmitted as email through SMTP. It is widely used in the Internet's USENET email-based interest-group conferences.

V.32—Full-duplex 9600 bps over dial-up telephone lines with fallback to 4800 bps when line quality does not allow 9600-bps operation.

V.32bis—Communication specification for data transfer speeds at full duplex to 14400-bps over dial-up telephone lines with fallback to 12,200/9600/7200/4800 and full compatibility with V.32.

V.42—Communication specification for error control. Error control is automatic, and retransmission after link errors is transparent to the user.

V.42bis—Communication specification for data compression. Allows compression of data streams with repetitive data by a factor of a maximum of four.

WinSock—*Microsoft Windows Sockets*. Application programming interface (API) that defines a means by which IP sockets are mapped to the Windows environment. Exploiting it requires a vendor-specific WinSock driver, which is always implemented as Windows dynamic link library (DLL). Multiple conflicting WINSOCK.DLL files in a search path can cause IP driver and application errors or failure. WinSock is an evolving standard.

WAN—*Wide-area network*. A computer network involving one or more remote networks connected over long-distance telephone lines.

WWW—*World-wide web*. The Web, or W3, a service providing multimedia-capable hyperlinks between Internet resources, regardless of their physical location.

10BASE2—Thin Ethernet. Uses RG-58 coaxial cable.

10BASE-T—Twisted-pair Ethernet. Uses UTP (unshielded twisted-pair) data cable with RJ-45 connectors.

Appendix F: Installation Reference

This Router

Purchased from_____ Date_____

Technical Support phone number_____

Root and root passwords

On a Router, the login name for the administrator is *root*, and the associated password is the root password, which is factory-set to nothing (press <RETURN>). After configuring your Router, remember to set up a root password.

Name and password syntaxes

All types of names

- have 1 to 31 alphanumeric characters
- do not contain periods "."
- start with a letter
- are case-sensitive

All types of passwords are 6 to 15 alphanumeric characters, and are case-sensitive.

Router Parameters

For any Router, record all Router parameters in this section.

Table F-1. Parameters Required for Each Type of Router.

Model	Interfaces Supported
Sync Router	eth0, modem0, sync0
Async Router AR-P	eth0, modem0
Async Router AR-5	eth0, modem0, modem1, modem2, modem3, modem4

Plan how many modems will be used for LAN-LAN access and how many modems will be used for User-LAN (client) access. In the table below, record how each modem will be used. (Remember that only the AR-5 model has five modems, the others have only modem0.)

How will modem be used?	modem0	modem1	modem2	modem3	modem4
for LAN-to-LAN link, or for client access or for fallback on Sync Router (record one use only)					

Router

Serial Number_____(required for Technical Support)

Name_____

Your root password_____

Your link password_____

Date and time (yymmddhhmm[.ss] format)

IPX routing enabled? ___yes ___no

IP routing enabled? ___yes ___no

Home or Branch Office Designation (pick one only)

(Default route through): ___eth0 ___sync0 ___modem0

NOTE

When you are configuring a Router with multiple WAN interfaces, you will be asked during the configuration of each WAN interface, whether that interface is to be the default route, until you choose one. Indicate the default route through the WAN interface that connects to the home office, by answering "yes" when configuring that interface. After you have set the default route through a WAN interface, the question is not asked again during the remainder of the configuration process.

Ethernet Parameters

NOTE

*** Starred items are only required in networks that use TCP/IP.**

Ethernet (eth0) port

IPX parameters are only required for IPX (NetWare) networks;

IP parameters are only required for IP networks.

IPX Network Number (Ethernet 802.3)____

IPX Network Number (Ethernet II)____

IPX Network Number (Ethernet 802.2)____

IPX Network Number (SNAP)____

*IP address_____(d.d.d.d)

*IP subnet mask_____(d.d.d.d)

*Syslog IP address_____(d.d.d.d)

Optional information for Domain Name Servers:

*IP addresses: 1)_____(d.d.d.d)

2)_____(d.d.d.d)

*Domain suffix_____(e.g., for rns.com, enter rns.com)

Client Authentication Method (choose one method only)

1 __Names and passwords on Router

or

2 __SecurID server (TCP/IP is required)

Obtain a valid username and SecurID card from your SecurID administrator.

or

3 __RADIUS server

(**TCP/IP is required**. You can use more than one RADIUS server)

IP address_____(d.d.d.d)

Obtain a valid username and password from your RADIUS administrator.

Sync Parameters

NOTE

*** Starred items are only required in networks that use TCP/IP.**

sync0 port *For Sync Router only*

Type of synchronous line: _____

[leased (DDS) or non-leased (SW-56)]

Leased-line carrier_____(for example, Sprint, MCI, AT&T)

- **Remote Site via a leased line**:

  Name_____

  Authentication_____(None or PAP or CHAP)

  Link password (PAP or CHAP only)_____

  *IP address_____(d.d.d.d)

  *IP subnet mask_____(d.d.d.d)

OR

- **Remote Site via a non-leased line**:

  Phone number_____

  Maximum phone usage =_____minutes (default is 1440 minutes)

  Name_____

  Authentication_____(None or PAP or CHAP)

  Link password (PAP or CHAP only)_____

  *IP address_____(d.d.d.d)

  *IP subnet mask_____(d.d.d.d)

Modem Parameters

NOTE

*** Starred items are only required in networks that use TCP/IP.**

modem0 port Type_____(Router, remote client, Portmaster, NetBlazer, Other)

Remote phone number_____

Maximum phone usage =_____minutes (default is 1440 minutes)

- **If the Remote System is a Router**:

  Name_____

  Their link password (PAP or CHAP only)_____

  *IP address_____(d.d.d.d)

  *IP subnet mask_____(d.d.d.d)

- **If the Remote System is NOT a Router or remote client, you also need**:

  Authentication_____(None or PAP or CHAP)

  Login name_____

  Login password_____

  Dialer script filename (if Remote System is "Other")_____

OR

- **If this modem is to be used for remote client access**

  *Optional IP address_____(d.d.d.d)

modem1 port For Async Router AR-5 only

Type_____(Router, remote client, Portmaster, NetBlazer, Other)

Remote phone number_____

Maximum phone usage =_____minutes (default is 1440 minutes)

- **If the Remote System is a Router:**

  Name_____

  Remote's link password (PAP or CHAP only)_____

  *IP address_____(d.d.d.d)

  *IP subnet mask_____(d.d.d.d)

- **If the Remote System is NOT a Router or remote client, you also need:**

  Authentication_____(None or PAP or CHAP)

Login name_____

Login password_____

Dialer script filename (if Remote System is "Other")_____

OR

• **If this modem is to be used for remote client access**

*Optional IP address_____(d.d.d.d)

modem2 port For Async Router AR-5 only

Type_____(Router, remote client, Portmaster, NetBlazer, Other)

Remote phone number_____

Maximum phone usage =_____minutes (default is 1440 minutes)

• **If the Remote System is a Router**:

Name_____

Their link password (PAP or CHAP only)_____

*IP address_____(d.d.d.d)

*IP subnet mask_____(d.d.d.d)

• **If the Remote System is NOT a Router or remote client, you also need**:

Authentication_____(None or PAP or CHAP)

Login name_____

Login password_____

Dialer script filename (if Remote System is "Other")_____

OR

• **If this modem is to be used for remote client access**

*Optional IP address_____(d.d.d.d)

modem3 port For Async Router AR-5 only

Type_____(Router, remote client, Portmaster, NetBlazer, Other)

Remote phone number_____

Maximum phone usage =_____minutes (default is 1440 minutes)

• **If the Remote System is a Router**:

Name_____

Their link password (PAP or CHAP only)_____

*IP address_____(d.d.d.d)

*IP subnet mask_____(d.d.d.d)

• **If the Remote System is NOT a Router or remote client, you also need**:

Authentication_____(None or PAP or CHAP)

Login name_____

Login password_____

Dialer script filename (if Remote System is "Other")_____

OR

• **If this modem is to be used for remote client access**

*Optional IP address_____(d.d.d.d)

modem4 port For Async Router AR-5 only

Type_____(Router, remote client, Portmaster, NetBlazer, Other)

Remote phone number_____

Maximum phone usage =_____minutes (default is 1440 minutes)

• **If the Remote System is a Router**:

Name_____

Their link password (PAP or CHAP only)_____

*IP address_____(d.d.d.d)

*IP subnet mask_____(d.d.d.d)

• **If the Remote System is NOT a Router or remote client, you also need**:

Authentication_____(None or PAP or CHAP)

Login name_____

Login password_____

Dialer script filename (if Remote System is "Other")_____

OR

• **If this modem is to be used for remote client access**

*Optional IP address_____(d.d.d.d)

Client Parameters Planner

Use this sectionn to plan your client accounts in the client database on the Router.

For the Router

Client Access shift _____

(0000 - 2400 MTWRFSU)

For each Client

Client name:_____ (<8 characters)

Client password:_____ (<8 characters)

Account enabled: Yes____ No____

Access time: ____In ____Out ____Both

Time quota (1440 min max):_____

Idle time (240 sec default, 86400 sec max):_____

Callback phone number: _____

Assigned from within the client software

*IP address:_____

IPX network number:_____

Client name:_____ (<8 characters)

Client password:_____ (<8 characters)

Account enabled: Yes____ No____

Access time: ____In ____Out ____Both

Time quota (1440 min max):_____

Idle time (240 sec default, 86400 sec max):_____

Callback phone number: _____

Assigned from within the client software

*IP address:_____

IPX network number:_____

Client name:_____ (<8 characters)

Client password:_____ (<8 characters)

Account enabled: Yes____ No____

Access time: ____In ____Out ____Both

Time quota (1440 min max):_____

Idle time (240 sec default, 86400 sec max):_____

Callback phone number: _____

Assigned from within the client software

*IP address:_____

IPX network number:_____

NOTE

*** Starred items are only required in networks that use TCP/IP.**

Router Link Passwords Example/Worksheet

Look over the link password configuration example below, and use the worksheet on the next page. Use this worksheet to plan and coordinate the dialup router names and link passwords for up to five LAN-to-LAN remote sites. After installation is complete, store this worksheet in a safe place, and have it on hand when calling Technical Support.

Link Password Example

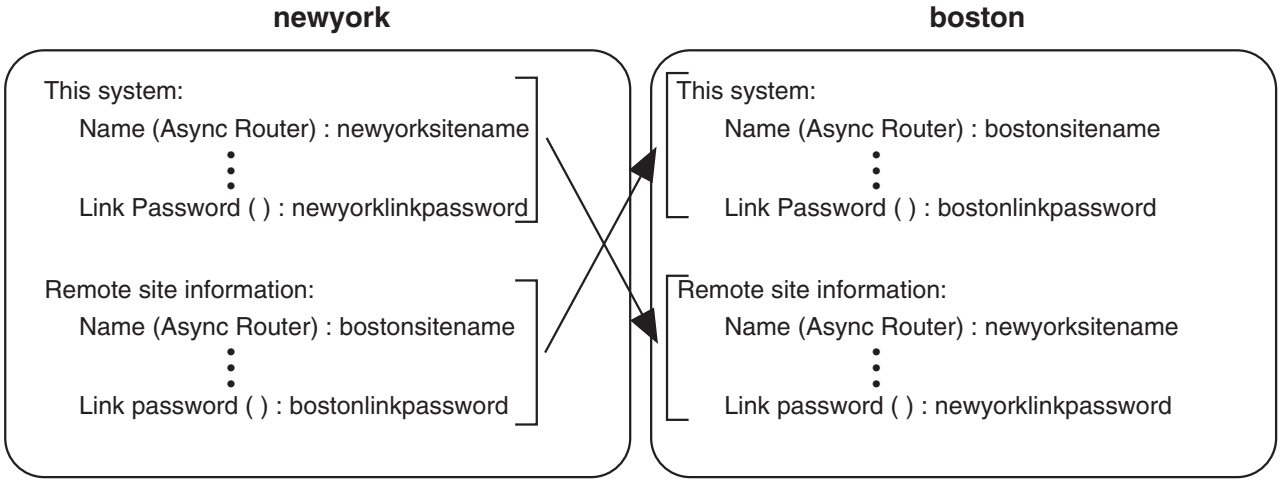

Figure F-1. Link Password Example.

Link Passwords Worksheet

Your Site **Site A**

On Router

Site A Name_____
Site A Password _____

Remote Site via modem0
Site0 Name _____
Site0 Link Password _____

Remote Site via modem1
Site1 Name _____
Site1 Password_____

Remote Site via modem2
Site2 Name _____
Site2 Link Password _____

Remote Site via modem3
Site3 Name _____
Site 3 Link Password_____

Remote Site via modem4
Site4 Name _____
Site4 Link Password _____

Remote Sites

Site0
For this system:
Site0 Name _____
Site0 Link Password _____
Remote Site
SiteA Name _____
SiteA Link Password _____

Site 1 Router
For this system:
Site1 Name _____
Site1 Link Password _____
Remote Site
SiteA Name _____
SiteA Link Password _____

Site2 Router
For this system:
Site2 Name _____
Site2 Link Password _____
Remote Site
SiteA Name _____
SiteA Link Password _____

Site3 Router
For this system:
Site3 Name _____
Site3 Link Password _____
Remote Site
SiteA Name _____
SiteA Link Password _____

Site4 Router
For this system:
Site4 Name _____
Site4 Remote Password _____
Remote Site
Site4 Name _____
Site4 Link Password _____

Site A _____

Site1 _____
Site2 _____
Site4

NOTE

If PAP or CHAP is used, names and link passwords are required.

MARCH 1996
LRA001A-R2
LRA005A-R2
LRS002A-R2

Async Router AR-P
Async Router AR-5
Sync Router
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1. Quick Reference

This chapter provides a quick reference guide for the commands, describing syntax, Router modes and prompts, and frequently used commands.

The chapters that follow describe each command and its parameters in detail.

- Generic commands
- IPX-only commands
- TCP/IP-only commands
- RouterVu commands
- General info

1.1 Conventions Used in This Chapter

Bold typeface—Commands and keywords. Enter the syntax exactly as shown.

Italics—Mandatory parameters that have values. Enter text or numbers in place of the italicized parameter name.

[ ]—Brackets enclose optional parameters.

|—Vertical bars separate mutually exclusive keywords. Enter only one keyword.

[**x** | **y** | **z**]—Choose one and only one of the options (X, Y, Z), or choose none.

{ }—Curly brackets enclose a list of mandatory, mutually exclusive parameters. You must choose one.

[x] [y] [z]—You must choose at least one item (X, Y or Z), and you may choose more than one at the same time, e.g, x y.

< >—Chevrons enclose a list of mandatory parameters. Choose at least one, although you can include more than one.

<RETURN>—At the end of each command press <RETURN> to execute it. For clarity, some commands are shown on more than one line; do not press <RETURN> until the end of the command.

1.2 Interface Addresses

The *iface*[*/frame_type*] parameters indicate the interface and frame type. iface is specified as one of the following, depending on your Router model: **eth0, sync0, modem0, modem1, modem2, modem3,** or **modem4**. If **eth0** is selected, the *frame_type* can be specified as part of the interface, and can be either **802.3**, **802.2**, **SNAP** or **II** (for Ethernet Type 2). Use a slash to separate the *iface* from the *frame_type*, e.g., **eth0/802.2**. If left unspecified, the default *frame_type* is **802.3**.

For the Ethernet interface, the *iface* parameter is a string of the form *eth0/frame_type*. For all other interfaces, iface is of the form *modemX*. Examples are:

`ethN`	Ethernet `N` interface, raw 802.3 frame type
`ethN/802.3`	Ethernet `N` interface, raw 802.3 frame type

`ethN/II`	Ethernet `N` interface, Ethernet Type II frame type
`ethN/SNAP`	Ethernet `N` interface, 802.3 SNAP frame type
`ethN/802.2`	Ethernet `N` interface, 802.3 LLC frame type
`modem N`	Modem `N` interface; modems are numbered from 0 to 4, depending on your Router model. See the User's guide for details.
`sync0`	Synchronous interface (Sync Router only)

1.3 Generic Commands

`?` — *Display mode (TCP/IP or IPX) command summary*

access shift *shiftstart shiftstop* **[MTWRFSU]** — Time is in *hhmm* format
access shift 0
access shift — *Sets Router's primary shift time*

asystat [*iface* [*iface*] ...] — *Display interface statistics*

authenticate add server *host*[:*port*]
authenticate delete server *host*
authenticate method {**radius** | **securid** | **local**}
authenticate retry *count*
authenticate show [**securid**]
authenticate test *user-id*
authenticate timeout *value_in_seconds* — *Display or change authentication method for clients*

client add [**-e**] [*clientname*]
client delete [**all** | *clientname*]
client list [*clientname*]
client modify [*clientname*] — *Display/edit client information*

config firewall *iface*
config modify
config reset
config save
config show — *Modify/display Router configuration*

date [*yymmddhhmm*[.*ss*]] — *Display/set date*

default_mode [{ **ipx** | **tcp/ip**}] — *Display/set default protocol mode for commands at login*

Line mode dialer commands
dialup *iface* **client** [**dummy** *secs*]
dialup *iface* **demand** *phone#* [*secs*]
dialup *iface* **demand_backoff** *phone#* [*secs*]
dialup *iface* **leased_answer**
dialup *iface* **leased_originate**

Other dialer commands
dialup *iface* **backup add** *phone#*
dialup *iface* **backup delete** *phone#*
dialup *iface* **backup primary [on | off]**
dialup *iface* **dial_log [flush]**

dialup *iface* **dtr_dial** [**dummy** *secs*] **dialup** *iface* **hangup** **dialup** *iface* **idle_time** *secs* **dialup** *iface* **inactive** **dialup** *iface* **incoming** [**dummy** *secs*] **dialup** *iface* **init** *init_string* **dialup** *iface* **keepup** *phone#* [*secs*] **dialup** *iface* **login_name** *name* **dialup** *iface* **login_pwd** *password* **dialup** *iface* **logprompt** [**on** | **off**] **dialup** *iface* **once** *phone#* [*secs*] **dialup** *iface* **quota** *mins* [**-e**] **dialup** *iface* **reset** **dialup** *iface* **script** *file* **dialup** [*iface*] **status** **dialup** *iface* **volume** [{**off** | **low** | **medium** | **high**}] **dialup** *iface* **warning** *mins*	*Configure/display dial-up parameters*
group *g_iface* **addslave** *iface* **group** *g_iface* **rmslave** *iface* **group** *g_iface* **fragment** [{**on** | **off** | *threshold*}] **group** *g_iface* **hangup** **group** *g_iface* **status**	*Configure/display multilink parameters*
help [*command*]	*Display mode (TCP/IP or IPX) command summary*
history	*Display numbered list of previous commands*
!*n*	*Execute command n*
!*str*	*Execute last command beginning with "str"*
!!	*Execute previous command*
hostname [*name*]	*Set or display Router's name*
logout	*Terminate Router session*
^D	*Terminate current Router session*
memory freelist **memory sizes** **memory status** **memory threshold**	*Display memory usage statistics*
monitor errors **monitor isdnerrors** **monitor performance**	*Display interface statistics*
passwd [**-n** *newname*] [*user*]	*Change either user or link password*
passwd -r *hostname*	*Change password for RADIUS server*
performance	*Display performance statistics every 10 sec*

Interface status

ppp *i&g_iface* *i&g_iface: for single or group ifaces*

Compression method selections

ppp *i&g_iface* **ccp** {**local** | **remote**} **method** [**stacker** | **history** *num* | **none** | **allow** [**on** | **off**]]

LCP negotiation

ppp *iface* **lcp** {**local** | **remote**} **accm** [*bitmap* | **allow** [**on** | **off**]] *iface: single ifaces only*
ppp *iface* **lcp** {**local** | **remote**} **authentication** [**chap** | **pap** | **none** | **allow** [**on** | **off**]]
ppp *iface* **lcp** {**local** | **remote**} **acfc** [**on** | **off** | **allow** [**on** | **off**]]
ppp *iface* **lcp** {**local** | **remote**} **pfc** [**on** | **off** | **allow** [**on** | **off**]]|
ppp *iface* **lcp** {**local** | **remote**} **magic** [**on** | **off** | *value* | **allow** [**on** | **off**]]
ppp *iface* **lcp** {**local** | **remote**} **mru** [*size* | **allow** [**on** | **off**]]
ppp *iface* **lcp** {**local** | **remote**} **default**
ppp *iface* **lcp timeout** [*seconds*]

LCP negotiation for Multilink

ppp *g_iface* **lcp {local | remote} mrru [{on | off** | *size* | **allow** [{**on | off**}] }] *g_iface: group ifaces only*

IPCP negotiation

ppp *i&g_iface* **ipcp {local | remote} address [on | off | allow [on | off]]**
ppp *i&g_iface* **ipcp {local | remote} compress [tcp** *slots* [*flag*] | **none | allow [on | off**]]

IPXCP negotiation

ppp *i&g_iface* **ipxcp** {**local | remote} compress [cipx** [*slots* [*flag*]] | **none | allow [on | off**]]
ppp *i&g_iface* **ipxcp {local | remote} network [on | off | allow [on | off**]]

ppp *i&g_iface* **ipxcp {local | remote} node [on | off | allow [on | off**]]
ppp *i&g_iface* **ipxcp {local | remote} default**

Authentication of users

ppp *i&g_iface* **chap user** *username* [*password*]
ppp *i&g_iface* **pap user** *username* [*password*] *Display/configure point-to-point protocol*

ps *Display status of running processes*

reboot *Drop all connections & restarts Router*

start {**discard | echo | ftp | rip | snmp | telnet**}
stop {**discard | echo | ftp | rip | snmp | telnet**} *Start or stop a server*

tip *iface* *Make a connection to a modem interface*

trace *iface* [**in | out | hex | ppp | packet | up** | > *filename*] *Trace data on an interface*

tux status *Display status of all TCP under IPX connections*

update [*iface*] **now**
update [*iface*] **init [{on | off}]**
update [*iface*] **periodic** [[+] *time1* [*time2* [*time3* [*time4*]]]]
update [*iface*] **timeout** [*mins*] *Update/synchronize networks*

version *Display Router's software version number*

who *Display information about logged-in users*

1.4 IPX-only Commands

filter add *name* { [**-i** *iface*[*/frame_type*]]
[**-s** *src_addr*]
[**-d** *dest_addr*]
[**-p** *pkt_type*] }
-t {**allow** | **deny** | **nodial**}
[**-f** {**inbound** | **outbound**}]
[**-o** {**before** | **after**} *existing_name*]
filter delete *name*
filter {**enable** | **disable**}
filter flush
filter move *name* [{**before** | **after**} *existing_name*]
filter status *Configure/display IPX filters*

ifconfig [*iface[/frame_type]* [**network** *net_number*] [{**up** | **down**}]]
ifconfig *iface* [**speed** [*bps*]] *Configure interface for IPX*
ifconfig [*iface* [**linkaddr** *directory_number* [*/SPID*]]] *Configure interface to assign isdn address and distinguishes between multipoint and point-to-point connection via SPID assignment*

ipx broadcast
ipx internal_net [*internal_net_number*]
ipx optimize [**on** | **off**]
ipx priority
ipx routing [{**enable** | **disable**}]
ipx spx
ipx trace *Display/configure IPX protocol parameters*

netstat [-m] [-p {ipx | rip | sap | pburst}] [-s] *Display IPX network statistics*

ping *server_name* *Send diagnostic packets to test operation*
ping *router_name* *of remote Routers, clients or servers*
ping *network.node_address*
ping -s {*server_name* | *router_name* | *network.node_address*} [*count*]

ripfilter add *name*
{ [**-i** *iface* [*/frame_type*]]
[**-q** *query_type*]
[**-n** *network*] }
-t {**allow** | **deny** | **nodial**}
[**-f** {**inbound** | **outbound**}]
[**-o** {**before** | **after**} *existing_name*]
[**-h** {*hopcount*}]
ripfilter delete *name*
ripfilter {**enable** | **disable**}
ripfilter flush
ripfilter move *name* [{**before** | **after**} *existing_name*]
ripfilter status *Configure/display RIP filters*

For Modem Interfaces Only

route add *dest_net iface* [*metric*] [*ticks*]

For Ethernet Interface Only

route add *dest_net iface* [*/frame_type*] *router_addr* [*metric*] [*ticks*]

For any Interface

route
route broadcast *iface* [*/frame_type*] [{**enable** | **disable**}]
route -f
route delete *dest_net*
route update *iface* [*/frame_type*] [{**enable** | **disable**}] *Configure/display IPX routing tables*

sap
sap add *name iface* [*/frame_type*] *server_type server_addr* [*hops*]
sap broadcast *iface* [*/frame_type*] [{**enable** | **disable**}]
sap delete *name*
sap -f
sap roundrobin [{**on** | **off**}]
sap update *iface* [*/frame_type*] [{**enable** | **disable**}] *Configure/display IPX static SAP entries*

sapfilter add *name*
{ [**-i** *iface[/frame_type]*]
[**-q** *query_type*]
[**-s** *server_type*]
[**-n** *server_name*] }
-t {**allow** | **deny** | **nodial**}
[**-f** {**inbound** | **outbound**}]
[**-o** {**before** | **after**} *existing_name*]
[**-h** {*hopcount*}]
sapfilter delete *name*
sapfilter {**enable** | **disable**}
sapfilter flush
sapfilter move *name* [{**before** | **after**} *existing_name*]
sapfilter status *Configure/display SAP filters*

spoof *iface* **watchdog** [{**on** | **off**}] *Enable/disable protocol spoofing*

tcp/ip [*tcp/ip_command param ...*] *Change to internet mode (TCP/IP)*

1.5 TCP/IP-only Commands

arp [*host_addr*]
arp -a
arp -d *host_addr*
arp -f
arp -p [{**on** | **off**}]
arp -s *host_addr ether_address* [*pub*] *Configure/display ARP table*

domain addserver *host_addr* [*host_addr...*]
domain dropserver *host_addr* [*host_addr...*]
domain cache list
domain cache size [*count*]

domain listservers
domain query *host_addr*
domain retry [*count*]
domain suffix [*domain_suffix*]
domain cache list — *Configure/display the Internet Domain Name*
domain cache size [*count*] — *Service*

filter add *name* { [**-s** {[*src_addr/bits*] [*src_port*]}]
[**-d** {[*dest_addr/bits*] [*dest_port*]}]
[**-p** *proto*]
[**-l** [{**syslog** | **trap** | **both**}]]
[**-i** *iface*]
[**-f** {**inbound** | **outbound**}] }
-t {**allow** | **deny** | **nodial** | **unreach**}
[**-o** {**before** | **after**} *existing_name*]
filter delete *name*
filter {**enable** | **disable**}
filter flush
filter move *name* [{**before** | **after**} *existing_name*]
filter spoof *iface* [{**enable** | **disable**}] [**syslog**] [**trap**]
filter status
filter try *src_addr* [**-s** *port*] *dest_addr* [**-d** *port*] [**-p** *proto*] — *Configure/display IP filter information*

icmp status — *Display ICMP protocol status*

ifconfig [*iface* [**address** *addr* [*/bits*]]
[**broadcast** *addr*]
[**metric** [*hops*]]
[**mtu** *size*]]
[**netmask** *mask*]
[**peer** *addr*[*/bits*]]
[**rip** [{**active** | **passive** | **off**}]]
[**speed** [*bps*]]
[{**up** | **down**}] — *Configure network interface parameters*

ifconfig [*iface* [**linkaddr** *directory_number* [*/SPID*]]] — *Configure interface to assign ISDN address and distinguish between multipoint and point-to-point connection via SPID assignment*

ip address [*host_addr*]
ip routing [{**enable** | **disable**}]
ip rtimer [*seconds*]
ip status
ip ttl [*hops*] — *Configure/display IP protocol information*

ipx [*ipx_command param ...*] — *Change to IPX mode*

netstat [-a] [-s] [-r] [-m] — *Show protocol and memory statistics*

ping *dest_addr*
ping *dest_addr* [*packet_size*]
ping -s *dest_addr* [*packet_size*] [*count*] — *Send ICMP ECHO_REQUEST packets to network nodes (to see if the remote node is up and running)*

rip accept *router_addr*

rip add *host_addr seconds* [*flags*]
rip delete *host_addr*
rip duplicate [{**on** | **off**}]
rip merge [{**on** | **off**}]
rip netmask add *net_addr/net_bits/subnet_bits*
rip netmask delete *net_addr/net_bits*
rip netmask list
rip refuse *router_addr*
rip request *router_addr*
rip status *Configure/display RIP Protocol*

route
route add *dest_addr*[*/bits*] *iface router_addr* [*metric*]
route addprivate *dest_addr*[*/bits*] *iface router_addr* [*metric*]
route add default *iface router_addr* [*metric*]
route delete *dest_addr*[*/bits*] [*iface*]
route [-f]
route lookup *dest_addr* *Configure the routing tables*

snmp set community *community_name* **[-p {ro | rw}] [-t {on | off}]**
snmp delete community *community_name*
snmp set acl *community_name host_addr* [*host_addr ...*]
snmp delete acl *community_name host_addr* [*host_addr ...*]
snmp set authtrap {**on** | **off**}
snmp set contact *contact_string*
snmp set location *location_string*
snmp status [**-c** [*community_name*]] *Configure/display the Simple Network Management Protocol*

syslog {**on** | **off**}
syslog address *host_addr*
syslog class *class_value*
syslog message *message_string*
syslog priority *priority_value*
syslog status *Configure/display system logging utility*

tcp irtt [*milliseconds*]
tcp mss [*size*]
tcp reset *tcb_addr*
tcp rtt *tcb_addr rtt*
tcp status [*tcb_addr*]
tcp window [*size*] *Configure/display Transmission Control Protocol information*

traceroute [**-w** *wait*] [**-m** *max_ttl*] *Trace the route to a host*
[**-q** *nqueries*] *host_addr*

udp status *Display User Datagram Protocol status*

1.6 RouterVu Commands

RouterVu enables users on IPX networks to log into and configure the Router remotely. RouterVu is a client/server application, with the client code running in DOS on a PC, and the server code running on the Router.

RouterVu commands can only be used on a PC-DOS or compatible computer. Do not enter RouterVu commands on the Router console.

The RouterVu utility works over IPX networks. Using RouterVu from a PC, you can:

- configure local Routers using a PC on the local Ethernet
- configure remote Routers
- troubleshoot network problems from both ends (Routers)

You can select a specific Router by name or by IPX address (network number).

1.6.1 SYNOPSIS

routervu *name* | *address*	*Establishes interactive session with specified*
routervu -n	*Displays all Routers on network*
routervu -a	*Displays all Routers and servers on network*
routervu -p {*name* | *address*}	*Pings once to Router specified*
routervu -o *filename*	*Saves keystrokes to script file specified*
routervu	*Displays routervu command syntax*

1.6.2 SUBCOMMANDS

`routervu`

Displays *routervu* command syntax.

`routervu name`

Establishes an interactive session with a Router called *name*.

`routervu -n`

Displays the names of all connected Routers.

`routervu -a`

Displays the names of all connected Routers and servers.

`routervu -p {name | address}`

Pings once to the Router specified. Ping sends echo packets over the network to solicit a response from a Router or Netware server, thereby determining connectivity.

`routervu -o filename`

Saves the keystrokes to the script file *filename*.

1.6.3 EXAMPLES

- Display *routervu* command syntax.

```
routervu

HOPPERVU Version 1.2 May 1, 1995

RNS (c) 1995 All Rights Reserved.

Usage HOPPERVU target  Establish interactive session
      HOPPERVU -n      Show Router names
      HOPPERVU -a      Show Router and Server names
      HOPPERVU -p      ping
      HOPPERVU -o      script_file Keep script file
```

- Connect to a remote Router named Kansas.

```
routervu kansas
```

- List to screen all available Routers.

```
routervu -n

HOPPERVU (c) 1995 RNS

Building list...

 anole     00001111.02CF1F80060A  (Router)
 archer    00001111.02CF1F800197  (Router)
 arnie     00001111.02CF1F8006C8  (Router)
 dinosaur  99990001.02CF1F80010F  (Router)
 dragon    12340001.02CF1F8001FC  (Router)
 hqs 00001111.02CF1F8004E7  (Router)
 NDNLL1    00000011.02CF1F8001B7  (Router)
```

- List to screen all available Routers and servers.

```
routervu -a

HOPPERVU (c) 1995 RNS

Building list...

 anole     00001111.02CF1F80060A  (Router)
 archer    00001111.02CF1F800197  (Router)
 arnie     00001111.02CF1F8006C8  (Router)
 DAFFY     00DAFF00.000000000001  (IPX File Server)
 DAFFYII   00004321.000000000001  (IPX File Server)
 dinosaur  99990001.02CF1F80010F  (Router)
 dragon    12340001.02CF1F8001FC  (Router)
 hqs       00001111.02CF1F8004E7  (Router)
```

- Copy all screen output to the file named *session.now*. This is useful to when trying to document the configuration of a remote Router.

```
routervu -o session.now
```

- Connect to a Router (boston), capture all screen displays and put them into a file (bstscrns).

```
routervu boston -o bstscrns
```

1.7 General Info

1.7.1 Router Modes & Prompts

The Router is always in either TCP/IP mode or IPX mode. The prompt on your terminal indicates the current mode of the Router (indicated by (**tcp/ip**)*router_name*> or (**ipx**)*router_name*>).

TCP/IP commands are only valid in TCP/IP mode (indicated by the prompt (**tcp/ip**)*router_name*>). IPX commands are only valid in IPX mode (indicated by the prompt (**ipx**)*router_name*>). Generic commands can be entered in either TCP/IP or IPX mode.

1.7.2 Frequently-Used Commands

About TCP/IP and IPX modes

Your Router has two modes: tcp/ip for TCP/IP networks and ipx for IPX networks. An interface (isdn1, eth0, modem0, modem1, etc.) can fail in tcp/ip mode, and still be operating in ipx mode simultaneously, up in both modes, or vice versa. When running both TCP/IP and IPX protocols simultaneously, as you bring an interface up or down, take note of whether your Router is in tcp/ip or ipx mode when you issue the command. If you want the interface up or down in the other mode as well, change to the other mode and issue the command again. To change modes, enter **tcp/ip** or **ipx** alone or as a prefix to the command.

These commands are often used to collect status information:

- **asystat—**Displays interface statistics. Use **asystat** to check current interface status (modem LEDs) and settings.
- **config show—**Displays the current configuration as a list of individual commands that execute when the Router starts. When you contact customer support, have a printed output of **config show** available to answer questions regarding your Router's current configuration.
- **dialup** *iface* **status—**Displays the current dialup settings for a given interface. **Dialup** tells you how the line is configured ("client" for CLIENT-to-LAN operation and either "demand," "demand_backoff," etc., for LAN-to-LAN operation), total connection time, and quota information.
- **ifconfig** *iface*—Display and configure IPX and TCP/IP network interface parameters. Note that the output of **ifconfig** depends on the current mode of operation of the Router (either tcp/ip or ipx). Use **ifconfig** to determine Ethernet frame types, assigned IP addresses on interfaces (tcp/ip mode only), or IPX network numbers (ipx mode only), and the number of packets sent and received.
- **netstat -m—**Displays the amount of free memory, number of failed memory allocations, number of memory errors, and network usage statistics. This information may be useful when contacting Technical Support.
- **netstat -s—**Displays TCP/IP or IPX network statistics, depending upon the current mode (tcp/ip or ipx) of the Router. The **netstat** output is more detailed than the **ifconfig** network statistics output, and may also be useful when contacting Technical Support.
- **version—**Displays the current release level of the Router software.

Commands often used to troubleshoot problems include:

- **config modify—**Use **config modify** to check and verify your Router's current configuration. **Config modify** prompts you through the configuration process and supplies defaults based on the current configuration.

- **dialup modem*X* dial_log—**Use to view the types of packets that caused the last 5 dials.
- **history—**Use **history** to check and verify all commands entered since you logged on.
- **ifconfig** *iface*—Use **ifconfig** to view the status of the interfaces.
- **performance—**Displays performance statistics, dynamically updated every ten seconds.
- **ping** *IP_address*—For TCP/IP sites only. When trying to determine if an IP routing problem exists, use ping first. Use **ping** to verify that you can connect out (of your network). For example, try "**ping rns.com**." **Ping** sends an ICMP echo-request packet to a remote host. A successful ping means that the packet was able to get to the remote host, and the remote host knew how to send the packet back to the Router.
- **ppp** *iface*—Use **ppp** to display and configure Point-To-Point Protocol (PPP) statistics. The Router uses PPP to establish communication with remote devices. When used without optional parameters, **ppp** *iface* displays information about the current state of authentication, and the status of the PPP connection. Also use **ppp** to provide local and remote IP addresses, and to show if the line is connected or not.
- **tip** *iface*—For TCP/IP sites only. Use **tip** to enter modem commands directly, i.e., to send modem commands directly to the modem interfaces. Use **tip** when trying to determine if a particular modem is functioning properly and responding to Router commands. **Tip** is similar to a "Terminal Mode" session on a communications program, and can only can be used on an inactive modem interface. To make an interface inactive, type "dialup modemX inactive," where modemX is the interface desired. After your tip session, bring the modem interface back up by issuing either a "dialup modemX demand" or "dialup modemX demand_backoff" if the line is configured for LAN-to-LAN, or "dialup modemX client" if the line is configured for User-to-LAN.
- **trace** *iface*—Use **trace** to view packet traffic across the Router, as it happens. **Trace** also displays the headers of all packets seen on that interface, which is useful when determining which types of packets are moving across a specific interface. Packets are shown with their origin and destination addresses.
- **traceroute** *IP_address*—For TCP/IP sites only. Use **traceroute** to show you the route taken to reach an IP address. Try "**traceroute rns.com**." Traceroute displays each individual device that the Router is sending packets through, to get to the remote ip_address. Use **traceroute** to determine if packets are being routed correctly by the Router and the other routers on your network.
- **update** [*iface*] **now—**Use **update** to dial the modem or ISDN line and connect to the remote system on a particular dialup interface. Use **update** to test the Router's dialer script. Using **update now** with no interface specified will dial all modem and ISDN lines.

1.7.3 CONFIG.NET EXAMPLE

At boot time, the Router executes the CONFIG.NET file on the Router boot diskette (much like a DOS batch file). Each line in the CONFIG.NET file is a command that you can execute manually from the system console (or telnet session, or terminal emulator).

The following CONFIG.NET file represents a simple Router configuration. If you decide to use parts of it, make sure you use your own IP addresses and IPX network numbers.

CONFIG.NET file (supporting TCP/IP and IPX routing)

```
hostname Router
ip address 0.0.0.0
ifconfig console mtu 1500
ifconfig eth0 netmask 255.255.255.0 broadcast 0.0.0.255 mtu 1500
```

```
ifconfig modem0 netmask 255.255.255.0 peer 0.0.0.0 mtu 1500
dialup modem0 demand 555-5555 240
dialup modem0 volume low
domain suffix rns.com
domain addserver 0.0.0.0
ppp modem0 lcp local auth chap
route add 0.0.0.0/0 modem0 0.0.0.0
route add default eth0
snmp set location "Computer Room"
snmp set contact "BBC Technical Support"
snmp set community public
start discard
start echo
start ftp
start telnet
start snmp
ifconfig console up
ifconfig eth0 up
ifconfig modem0 up
ipx
ipx routing enable
ifconfig eth0/802.3 network 00000001 up
ifconfig eth0/II network 00000002 up
ifconfig eth0/802.2 network 00000003 up
ifconfig eth0/SNAP network 00000004 up
ifconfig modem0 up
tcp/ip
```

The following table is generated by the previous CONFIG.NET file:

```
(tcp/ip)Router> route

Destination     Bits  Interface  Router/Next Hop  Metric Timer   Use
    Flags

0.0.0.0         /0    modem0     0.0.0.0          1      0       0
0.0.0.0         /0    eth0                        0      0       0
default         /0    eth0                        1      0       0

3 Route entries
```

1.7.4 About IP Addresses

Throughout many of the Router's command descriptions, both Internet and Ethernet addresses are specified as command parameters. IP addresses are specified in 4-byte Internet dotted-quad notation (xxx.xxx.xxx.xxx), such as 128.66.16.100. When specifying subnet bits for an IP address, a */bits* parameter may be appended to the IP address. Only contiguous bits are supported for a Router subnet mask. If no bit number is specified, 32 bits are assumed as default. Ethernet addresses are specified in standard 6-byte Ethernet notation (xx:xx:xx:xx:xx:xx), such as 02:CF:1F:80:02:AB.

1.7.5 IPX Filter Examples

NetBios packets are broadcasted constantly from NetBios hosts, often raising the link on a Router enough to incur unnecessary phone charges. The following filter blocks NetBios packets (destination any.any.455) on all interfaces.

```
(ipx)kansas> filter add -d 0.0.455 -t deny
```

To block these packets on a single interface, like modem0, enter:

```
(ipx)kansas> filter add -i modem0 -d 0.0.455 -t deny
```

2. Generic Commands

Generic Router commands function the same way in both network environments supported by the Router: IPX and TCP/IP. If a command operates differently depending upon its network environment, it is listed in a separate chapter. See **Chapter 3, IPX-only Commands,** and **Chapter 4, TCP/IP-only Commands**.

The Router has a mode for each network type. The prompt on the screen reflects its current mode: **tcp/ip** or **ipx**. Change modes by entering **tcp/ip** or **ipx** alone or as a prefix to the command.

- access shift -display or change primary shift time for clients
- asystat -display interface statistics for Router
- authenticate -display or change authentication method for clients
- client -display or change remote client data on Router
- config -display or change Router configuration
- date -display or change date
- default_mode -display or set default protocol mode (ipx or tcp/ip)
- dialup -display or change dialup parameters
- group -display or change multilink parameters
- help -display commands available
- history -display last 25 Router commands issued
- hostname -display or change name of Router
- isdn -display or change ISDN protocol parameters
- logout -terminate session with Router
- memory -display memory usage statistics
- monitor -display interface statistics
- passwd -change user or link password for Router
- performance -display real-time performance statistics
- ppp -display or configure PPP protocol parameters
- ps -display the status of running processes
- reboot -drop all connections and restart Router
- start/stop -start/stop a server (ftp, rip, snmp, telnet)
- trace -display packet types sent or received on a interface
- tux -display status of all TCP under IPX connections
- update -update routing tables using RIP and SAP
- version -display software release level of Router
- who -display who is logged onto the Router

2.1 Interface Addresses

The *iface*[*/frame_type*] parameters indicate the interface and frame type. *iface* is specified as one of the following, depending on your Router model: **eth0, sync0, modem0, modem1, modem2, modem3,** or **modem4**. If **eth0** is selected, the frame_type can be specified as part of the interface, and can be either **802.3, 802.2, SNAP,** or **II** (for Ethernet Type 2). Use a slash to separate the *iface* from the *frame_type*, e.g., eth0/802.2. If left unspecified, the default *frame_type* is 802.3.

For the Ethernet interface, the iface parameter is a string of the form eth0/frame_type. For all other interfaces, iface is of the form modemX. Examples are:

`ethN`	Ethernet *N* interface, raw 802.3 frame type
`ethN/802.3`	Ethernet *N* interface, raw 802.3 frame type
`ethN/II`	Ethernet *N* interface, Ethernet Type II frame type
`ethN/SNAP`	Ethernet *N* interface, 802.3 SNAP frame type
`ethN/802.2`	Ethernet N interface, 802.3 LLC frame type
`modem N`	Modem *N* interface; modems are numbered from 0 to 4, depending on your Router model. See the User's guide for details.
`sync0`	Synchronous interface (Sync Router only)

2.2 access shift

Displays or changes the primary time clients can access a LAN through the Router

Syntax

access shift *shiftstart shiftstop* [**MTWRFSU**]

access shift 0

access shift

Description

The **access shift** command configures the hours and days of the week clients are allowed to access the LAN through the Router. The **access shift** command does not affect LAN-to-LAN operations.

Clients can have individual access times assigned using the **client add** or **client modify** commands. Access to the Router by a client depends upon the access shift assigned, and the access time value (in, out or both) assigned to the client. A client assigned a value of *access time - in* will be able to access the Router during the primary shift. A client assigned a value of *access time - out* will be able to access the Router at any time outside the primary shift. A client assigned a value of *access time - both* will be able to access the Router at any time (24-hour access).

Subcommands and parameters

access shift *shiftstart shiftstop* [**MTWRFSU**]

shiftstart—The time of day the primary shift starts specified in *hhmm* format using the 24-hour clock. The default is 0800 or 8:00 a.m.

shiftstop—The time of day the primary shift stops specified in *hhmm* format using the 24-hour clock. The default is 1700 or 5:00 p.m. The primary shift hours are the access time for a client with an

access time equal to *in*. See the *client access* command.

[**MTWRFSU**]—The days of the week desired for primary shift.

- M - Monday
- T - Tuesday
- W - Wednesday
- R - Thursday
- F - Friday
- S - Saturday

access shift 0

Resets the primary access shift to the default 8 a.m. to 5 p.m., Monday through Friday.

access shift

Displays the currently defined primary shift.

Example

To set the primary shift hours from 8 a.m. to 9 p.m., Monday through Friday, enter:

access shift 800 2100 MTWRF

As a result of executing the above command, the *OUT of shift* hours become 9 p.m. to 8 a.m. Monday through Friday, and, on the weekend, 24 hours per day.

See also

client access

client add

client modify

2.3 asystat

Displays Router interface statistics

Syntax

asystat [*iface* [*iface*]...]

asystat

Description

The **asystat** command displays various statistics compiled for the asynchronous interface (*iface*) specified.

Subcommands and parameters

asystat [*iface* [*iface*] ...]

Enter specific interface names for a display of their statistics only. Leave a space between interface names.

iface **eth0, modem0-4, console**

asystat

Enter **asystat** alone for a display of all modem interface statistics.

Example

A typical display of *modem0* statistics is:

asystat modem0

```
(tcp/ip)pelican> asystat modem0
modem0: [NS16550A] [trigger 0x7e] [cts flow ctrl] [rlsd line ctrl] 115200 bps
MC: int 110  DTR On  RTS On  CTS On  DSR On  RI Off  DCD Off
Port: 2f8  IRQ 3 (ENA)  iir=c1 ier=0b MCR=0b LSR=60 MSR=30
RX: int 403487 chars 1364679 hw over 0 hw hi 0 fifo TO 169269 sw over0sw hi 0
TX: int 351054 chars 5057509 THRE TO 0
asyp->msr 38 count 0
```

MC: physical line status:

- int 0 – Number of modem control interrupts
- DTR Off – Data Terminal Ready signal status
- RTS Off – Request To Send signal status
- CTS Off – Clear To Send signal status
- DSR Off – Data Set Ready signal status
- RI Off – Ring Indicator signal status
- CD Off – Carrier Detect signal status

RX: interface receive statistics:

- chars 48 – number of bytes received
- hw over 0 – number of hardware receive overruns
- sw over 0 – number of software receive overruns

TX: interface transmit statistics:

- int 0 – number of transmit interrupts
- chars 101 – number of bytes transmitted

2.4 authenticate

Select and configure authentication methods for dial-in clients

Syntax

authenticate add server *host*[:*port*]
authenticate delete server *host*
authenticate method {**radius | securid | local**}
authenticate retry *count*
authenticate show [**securid**]
authenticate test *user-id*
authenticate timeout *value_in_seconds*

Description

The **authenticate** command allows you to specify which authentication method to use for dialin clients, and to manipulate the server database for non-local authentication methods. Modem ports can be selected to support dial-in clients or to provide LAN-to-LAN services, but not both. Modem ports selected to provide LAN-to-LAN service use the authentication method specified using the PPP command (PAP, CHAP, SCHAP or none).

Subcommands and parameters

authenticate add server *host*[:*port*]

Authenticate add server is only available when the authentication method selected is RADIUS. Use *authenticate add server* to add a server to the list of RADIUS servers who are consulted when the Router verifies a dialin client's name and password. If a port is not specified, the default RADIUS port of 1645 is used. The *host* can be specified as a *hostname* (e.g. buffet@rns.com) or as an *IP address* in dotted-quad notation (e.g. 131.143.16.45).

authenticate delete server *host*

Authenticate delete server is only available when the authentication method selected is RADIUS. Use *authenticate delete server* to delete a server from the list of RADIUS servers who are consulted when the Router verifies a dialin client's name and password. The *host* can be specified as a *hostname* (e.g. buffet@rns.com) or as an *IP address* in dotted-quad notation (e.g. 131.143.16.45).

authenticate method {**radius | securid | local**}

Use *authenticate method* to select or change the authentication method used when the Router verifies a dialin client's name and password. The **local** option enables the Router to use the Router's client database when authenticating dialin clients.

authenticate retry *count*

Use *authenticate retry* to specify the number of times that a client can attempt to log in, using a name and password. The default number of attempts allowed is 3. This retry number only affects login attempts prior to the start of the PPP protocol, and does not have any effect on the number of attempts allowed during PAP and CHAP authentication. If you are using RADIUS or the local password file (Router), you must also specify which PPP authentication protocol will be used. Use the **ppp** command:

ppp *iface* **lcp local authentication** [**chap | pap | none | allow [on | off**]]

authenticate show [**securid**]

Use *authenticate show* to display the current authentication method selected, servers in use if any, and the number of successful and unsuccessful login attempts by dial-in clients. If SecurID is being used, additional configuration status is displayed.

authenticate test *user-id*

Use *authenticate test* to test the authentication method (RADIUS, SecurID or local) of a client.

authenticate timeout *value_in_seconds*

Use *authenticate timeout* to specify the timeout value used when the Router contacts a RADIUS or SecurID server. The timeout value is the time that the client will wait, in the event that no servers reply, **per available server**. The total timeout is the timeout value times the number of servers available. The default timeout value per RADIUS server is 10 seconds. The default timeout value per SecurID server depends on the each server's configuration, but is typically 3 seconds.

2.5 client

Manipulate the Router client database

Syntax

client add [**-e**] [*clientname*]
client delete [**all** | *clientname*]
client list [*clientname*]
client modify [*clientname*]

Description

The **client** command allows the administrator to manipulate client account database records. Each client record you manipulate has the following characteristics:

- client name
- client password
- account enabled
- access time
- time quota
- idle timeout
- callback phone#

The client database supports up to 100 clients. To permanently save modifications to the client database, execute the **config save** command after you make changes with the **client** command. If no name is supplied on the command network, you will be prompted for a client name.

Subcommands and parameters

client add [**-e**] [*clientname*]

Add a new client record to the database and specify its characteristics.

[**-e**] The express option adds clients automatically entering default values to *access time* (24 hours), idle timeout (240 seconds or 4 minutes) and time quota (1440 minutes or 24 hours) so you do not need to provide these values individually. This is the fastest way to add clients to the database.

clientname—If you enter a clientname a new record is added to the database and you are prompted to enter each of the client's characteristics, i.e., password, etc. If you do not enter a client name, then you will be prompted for the name and then the client characteristics. For convenience, once you are done, you are prompted to add another client to the database. Do not use *root, modem0, eth0* (interface names), etc. as client names. Additional client characteristics are:

Client password—When you enter the password, keep in mind that it is case-sensitive in Router applications and not case-sensitive in Async Client applications.

Account enabled—Allows the client to log on. Disabling the account allows the administrator to keep the database entry for a specific client while temporarily preventing that client's access. For example, this is useful when a person is out of town or on vacation.

Access time—Confines a client's Router access to certain times of the day. Specifies when a client is allowed access to the Router, depending on what is defined by the Router's *client access shift* command. Access allowed during the client access shift is called "in"; access allowed outside of the client access shift is called "out"; access at any time is called "both". For each client, specify only one of the three values: *in*, *out*, or *both*. The Router has only one client access shift used for every account in the database. The default access time is 24 hours, meaning that access is allowed all day.

Time quota—Each client may have a daily time quota for access to the network. The time quota is only activated for accounts with specified security callback number. The daily usage is stored for each client in memory and can be examined using the *client list* command. The time quota is specified in minutes. The default time quota is 1440 minutes or 24 hours.

Idle timeout—Disconnects a client after a certain amount of time has elapsed without data transmission. The idle timeout is specified in seconds, with default set to 240 seconds or 4 minutes.

Callback phone #—Adds another level of access security. When a client calls, once the client is validated and allowed access during the current shift, the Router examines the security callback number of that client. If the client is an Async Client, the router:

- tells the client to disconnect
- calls back the client at the security callback number

Callback phone # is only available for Async Clients.

client delete [**all** | *clientname*]

Delete a specific client's record or all clients' records.

all—Enter *all* to delete all existing records.

clientname—Enter the specific client name whose record you wish to delete.

client list [*clientname*]

List a specific client's record or, if you do not enter a name, list all clients' records.

clientname—Enter the specific client name whose record you wish to display.

client modify [*clientname*]

Change an existing client record's characteristics.

clientname—Enter the client name associated with the record you wish to change, and you are prompted with the client characteristics. For convenience, after you modify one client record, you are prompted for additional records to modify.

2.6 config

Configures the parameters required for the Router to operate properly. More sophisticated configurations must be accomplished with individual commands.

Syntax

config firewall *iface*
config modify
config reset
config save
config show

Description

config firewall *iface*

Configure an IP firewall on the *iface* interface. Refer to the *User's Manual* for the list of IP filters used in the firewall.

config modify

Modifies the current configuration. Displays the current setting for each configuration item as it is entered and allows the user to change the value.

config reset

Resets the Router to its default state. This is useful if the administrator wants to completely clear out a previous configuration. When this configuration is done, the Router is rebooted.

config save

Saves the current configuration including all items set by individual commands, so that the Router will be properly configured at the next system start.

config show

Displays the current configuration as a list of individual commands executed when the Router is started.

2.7 date

Display or set the date

Syntax

date [*yymmddhhmm* [*.ss*]]

Description

Sets the Router clock's current date and time to what you enter. Displays the clock's current date and time if you do not enter anything.

Subcommands and parameters

date [*yymmddhhmm* [*.ss*]]

Enter values for the year, month, day, hour, minutes and seconds:

yy	final two digits of the year, for example, 1996 is 96
mm	the month number (1-12), for example, October is 10
dd	the day number in the month, 1-31
hh	is the hour number in a 24-hour system
mm (second)	the second *mm* is the minute number
.ss	specifies seconds and is optional

The year, month, and day may be omitted. The current values are derived from the host clock and supplied as defaults.

Examples

date 10080045

Sets the date to *Oct 8, 12:45 AM.*

2.8 default_mode

Sets or displays the default login command protocol mode

Syntax

default_mode [{**ipx** | **tcp/ip**}]

Description

Sets or displays the mode Router users access by default when they log in. Entered with no argument, this command displays the current setting. The mode can be changed with the *tcpip* command.

Subcommands and parameters

default_mode [{**ipx** | **tcp/ip**}]

ipx	For an IPX network. This is the default.
tcp/ip	For a TCP/IP network

NOTE

config [reset | modify] sets the default start-up mode using the default_mode command. The algorithm used specifies that if IP routing is enabled, the default mode is "tcp/ip" otherwise, the default mode is ipx.

See also

config [reset | modify]

ipx

tcpip

2.9 dialup

Configure/display the dialup parameters

Syntax

Line mode dialer commands

dialup *iface* **client** [**dummy** *secs*]

dialup *iface* **demand** *phone#* [*secs*]

dialup *iface* **demand_backoff** *phone#* [*secs*]

dialup *iface* **leased_answer**

dialup *iface* **leased_originate**

Other dialer commands

dialup *iface* **backup add** *phone#*

dialup *iface* **backup delete** *phone#*

dialup *iface* **backup primary** [**on** | **off**]

dialup *iface* **dial_log** [**flush**]

dialup *iface* **dtr_dial** [**dummy** *secs*]

dialup *iface* **hangup**

dialup *iface* **idle_time** *secs*

dialup *iface* **inactive**

dialup *iface* **incoming** [**dummy** *secs*]

dialup *iface* **init** *init_string*

dialup *iface* **keepup** *phone#* [*secs*]

dialup *iface* **login_name** *name*

dialup *iface* **login_pwd** *password*

dialup *iface* **logprompt** [**on** | **off**]

dialup *iface* **once** *phone#* [*secs*]

dialup *iface* **quota** *mins* [**-e**]

dialup *iface* **reset**

dialup *iface* **script** *file*

dialup [*iface*] **status**

dialup *iface* **volume** [{**off** | **low** | **medium** | **high**}]

dialup *iface* **warning** *mins*

Description

The *dialup* command configures the dialup parameters for interface *iface*.

Subcommands and parameters

dialup *iface* **client** [**dummy** *secs*]

Sets the modem network to *client* mode. A network configured for *client* mode must have the *dialup client* command present in the network configuration. After setting a network to *client* mode, the *phone number*, *idle*, and *quota* fields are set to *zero*. When a client logs on, these fields are set to the values specified by the client account.

iface **modem0-4, sync0**

[**dummy** *secs*]**—Dummy** is a nonfunctioning argument. Sets the time in seconds before the Router hangs
up on the interface *iface*, when there is no traffic on that interface.

dialup *iface* **demand** *phone#* [*secs*]

Dials the phone number and then monitors the connection. If the remote device is down, and there is output queued, Router dials again. If no output has been queued in secs seconds, Router disconnects and resets the modem to ensure it is down. If a backup phone number is specified with dialup backup it is attempted if the primary phone number is busy or does not answer.

iface **modem0-4, sync0**

phone#—The primary phone number of the remote device you want to monitor. A backup phone number can be defined using the *dialup backup* subcommand.

secs The amount of time the Router waits for the remote device you are monitoring to connect and queue responses before switching back to the primary number.

dialup *iface* **demand_backoff** *phone#* [*secs*]

Operates similarly to the *demand* subcommand except that no connections are attempted for two minutes after a failed call attempt. One end should be configured demand and the other end should be configured *demand_backoff*. This prevents a deadlock if both sides are trying to prepare for a call at the same time. The configuration procedure automatically designates one side of a connection as *demand* and one side as *demand_backoff*.

iface	**modem0-4, sync0**
phone#	The phone number of the remote device.
secs	The amount of time the Router waits for the remote device you are monitoring to connect and queue responses before switching back to the primary number.

dialup *iface* **leased_answer**

When a link is established some types of leased lines require one end to be designated as the answering end. Contact your phone company for more information about your leased line.

iface	**modem0-4, sync0**

dialup *iface* **leased_originate**

When a link is established some types of leased lines require one end to be designated as *originate*.

iface **modem0-4, sync0**

dialup *iface* **backup add** *phone#*

Adds a backup phone number for a dialup interface. The Router uses the backup phone number only when the primary phone number fails to answer or is busy.

iface **modem0-4, sync0**

phone# Enter a backup phone number for times the remote device is busy or fails to answer.

dialup *iface* **backup delete** *phone#*

Removes the backup phone number for the remote device you specify and disables the backup function. The Router uses the backup phone number when the primary phone number fails to answer or is busy.

iface **modem0-4, sync0**

phone# Enter the phone number of the remote device where you want to disable the backup function.

dialup *iface* **backup primary** [**on** | **off**]

Configures the dialer to continue trying to reach the remote device by switching back to the primary phone number if the backup does not answer, or by simply continuing to ring the backup number.

Several other configurations exist:

- *dialup once*—Configures the dialer to dial once
- *dialup keepup*—Attempts to keep the line up
- *dialup demand*—Dials only when a packet arrives destined for a host on the other side of the phone network
- *dialup incoming*—Only allows incoming calls
- *dialup demand_backoff*—Disconnects and waits to see if the line is not idle when dialing is attempted

iface **modem0-4, sync0**

on Default. Select *on* for the Router to revert back to the primary phone number after disconnecting the backup number on the next dialup.

off Select *off* for the Router to continue using the backup phone number indefinitely.

dialup *iface* **dial_log** [**flush**]

Allows you to view the type of packets that caused the last five dials on the specified dialup interface. The following fields from the packets are displayed: *source address*, *destination address*, *source* and *destination port* or *socket number*, and *protocol number* (if applicable).

iface **modem0-4, sync0**

flush Erase entries in the dial log.

dialup *iface* **dtr_dial** [**dummy** *secs*]

Used with synchronous ISDN TAs that do not support V.25bis dialing. We recommend you do not use these types of ISDN TAs. This command is only valid for Sync Routers.

iface	**sync0**
[**dummy** *secs*]	**Dummy** is a nonfunctioning argument. Sets the time in seconds before the Router hangs up on the interface *iface*, when there is no traffic on that interface.

dialup *iface* **hangup**

Immediately hangs up (breaks connection of) the interface *iface*.

dialup *iface* **idle_time** *secs*

Sets the time in seconds before the Router hangs up on the interface *iface*, when there is no traffic on that interface.

dialup *iface* **inactive**

Terminates a dialer process, leaving the line in the DTR OFF state. In this case, no incoming or outgoing calls may be made on the network. A new dialup command is required to re-activate the line. In some installations the network should be reverted to a backup line using *dialup demand*.

iface	**modem0-4, sync0**

dialup *iface* **incoming** [**dummy** *secs*]

Allows only incoming calls on the line you specify. No attempt is made to dial out on this network.

iface	**modem0-4, sync0**
[**dummy** *secs*]	**Dummy** is a nonfunctioning argument. Sets the time in seconds before the Router hangs up on the interface iface, when there is no traffic on that interface.

dialup *iface* **init** [*init_string*]

Shows or sets the modem initialization string executed each time the unit or modem restarts.

iface	**modem0-4** (the interface for which you wish to set the modem initialization string)
init_string	AT modem commands.

dialup *iface* **keepup** *phone#* [*secs*]

Dials the phone number, then monitors the network and repeats the dialing process if no input was received in *secs* seconds even after sending echo requests to peers or in the event the modem is down.

iface	**modem0-4, sync0**
phone#	The phone number of the remote device you want to keep up.
secs	Monitors the network and dials again if no input was received in *secs* seconds even after sending echo requests to peers or in the event the modem is down.

dialup *iface* **login_name** *name*

Establishes a user name for authentication operating between dialup routers.

iface	**modem0-4, sync0** (the interface for which you wish to establish a user for authentication)

name The user name to be established.

dialup *iface* **login_pwd** *password*

Establishes a password to coincide with the user's name for authentication when operating between other dialup routers.

Many routers present a standard login prompt:

```
login: name
Password: password
```

iface **modem0-4, sync0** (the interface for which you wish to establish a password)

password The password is typically seven characters in length.

dialup *iface* **logprompt** [**on** | **off**]

Turns on or off the generation of a "login:" prompt on asynchronous interfaces (modem0, modem1, etc.). The "login:" prompt enables clients to enter a name and password **prior to the start of the PPP protocol**. The prompt is on by default.

iface **modem0-4** (the interface for which you wish to establish a password)

dialup *iface* **once** *phone#* [*secs*]

Executes the redial procedure once. This is useful for testing the dialup parameters. The secs parameter is ignored.

iface **modem0-4, sync0** (the interface for which you wish to test parameters)

phone# The phone number of the remote device you want redialed.

secs ignored

dialup *iface* **quota** *mins* [**-e**]

Specifies the daily maximum number of minutes your Router may stay connected on outgoing calls. This is very useful if you have a misconfigured network that continuously attempts to send packets through a modem interface. The quota is reset every night at midnight or when a new **quota** command is given. The amount of quota left for the day is displayed in the **dialup status** command.

Monitor phone line usage closely after installation. Use the quota mechanism to limit phone costs.

iface **modem0-4, sync0** (the interface for which you wish to set a quota)

mins Enter the number of minutes you want allotted for the quota. The default is 1440 minutes, or 24 hours.

-e Returns an ICMP destination-unreachable packet to the sender when the quota is reached in addition to delivering the packet. This gives the user an indication that sending data to the destination is currently not allowed.

dialup *iface* **reset**

Stops the current dialer process and restarts it. This is a way to force a redial on a keepup or demand line where the idle timer has not yet expired. The configuration of the line is not changed.

iface **modem0-4, sync0**

dialup *iface* **script** *file*

Specifies the name of the dialer script for this interface. Instead of using the built-in modem commands, the dialer executes the commands from the dialer script. This is useful for complex dialing sequences or for operating between other vendor's dialup devices. See **Appendix B, Dialing Scripts**, for more information.

iface **modem0-4, sync0** (the interface for which you want to assign a dialer script)

file The name of the dialer script file.

dialup [*iface*] **status**

Displays the current dialup settings for a given interface or for all interfaces if *iface* is not specified. The modem line speed only appears when the modem is connected. The modem line speed is also sometimes missing from the dialup status display.

iface **modem0-4, sync0**

dialup *iface* **volume** [{**off** | **low** | **medium** | **high**}]

Controls the volume of the Router's modem speaker. When the speaker is disabled (using the *off* keyword), you will not hear incoming or outgoing calls. Use the low, medium and high keywords to adjust the volume to a more audible settings.

NOTE

We recommend leaving the speaker enabled when you initially install the Router. When the modem speaker is disabled, you will not know when the Router is placing calls.

iface **modem0-4**

off Disables the speaker.

low Sets the speaker volume to low.

medium Sets the speaker volume to medium.

high Sets the speaker volume to high.

dialup *iface* **warning** *mins*

Specifies the number of minutes a day your Router may use for outgoing calls before you receive a warning (a syslog message) calling attention to the high usage. The default *warning* is 240 minutes, or 4 hours. The warning time is reset every night at midnight or when a new warning command is given. The amount of time left for the day before a warning is displayed is shown in the *dialup status* command.

iface **modem0-4, sync0**

mins The number of minutes your Router may be connected to an outgoing call before receiving a warning. The default is 240 minutes or 4 hours.

2.10 help

Display command summaries

Syntax

help [*cmd*]

?

Description

The *help* command displays the list of commands available.

Subcommands and parameters

help

Alphabetically lists the commands available in your Router's current mode, as indicated by the prompt: IPX or TCP/IP. A one-line description of each command is provided.

help [*cmd*]

If you enter the command name, then *help* displays a textual description of the command and a usage line.

?

Displays the command names.

2.11 history

Displays a list of previous commands.

Syntax

history

!*n*

!*str*

!!

Description

Displays the previous 25 commands entered by the user in a number of ways. Executes the previous command.

Subcommands and parameters

history

Displays a numbered list of previous commands

!*n*

Re-executes command number n.

!*str*

Re-executes last command beginning with str.

!!

Re-executes the previous command.

2.12 hostname

Set or display host name

Syntax

hostname [*name*]

Description

Displays or defines the name of the Router.

Subcommands and parameters

hostname

Prints the name currently assigned to the router.

hostname [*name*]

Assigns a name to the router.

name—Enter a name for the router.

2.13 logout

Terminate a Router session.

Syntax

logout

^D

Description

Terminate the current Router session: either a remote telnet session or a login session using the console.

Subcommands and parameters

logout

Terminates Router session.

^D

The short code to terminate a Router session.

2.14 memory

Display memory statistics

Syntax

memory freelist
memory sizes
memory status
memory threshold

Description

The **memory** commands display memory-use statistics for the Router.

2.15 monitor

Display interface statistics

Syntax

monitor errors
monitor isdnerrors
monitor performance

Description

The **monitor** commands display statistics collected on the active interfaces of the Router.

2.16 passwd

Changes either user or link password

Syntax

passwd [**-n** *newname*] [*user*]
passwd -r *hostname*

Description

Use the **passwd** command to change a user name, a connection password, or the password shared with a RADIUS server. Only one user name, *root*, is pre-defined. You can define one local link password for the local router, up to five passwords for remote connections, one password for each of the Router's modems, and one password for each RADIUS server in use. The password stays the same for each login until the administrator changes it. No aging of passwords is performed.

When changing a password the user is prompted for the old and then the new. Both are required. The new password must be typed the same way twice to ensure accuracy. If no previous password exists, the new password must still be typed the same way twice.

New passwords must be at least five characters long if they combine capitalized and un-capitalized letters, or at least six characters long if in all in the same case. Although longer passwords are accepted, limit the maximum number of significant characters in a password to eight, because password algorithms do not work with more than 8 characters. The passwd file contains user and password information.

Subcommands and parameters

passwd [**-n** *newname*] [*user*]

-n	Change the name of the user specified to *newname*.
newname	Enter the new name of the user. You cannot change the username *root*.
user	Specify the user to whom the password is assigned. To change a connection password, use the hostname in the *user* parameter. To change a remote connection password, use the remote hostname in the *user* parameter.

passwd -r *hostname*

-r	Change the password shared with a RADIUS server.
hostname	Enter the name of the RADIUS server.

2.17 performance

Displays performance statistics every 10 seconds.

Syntax

performance

Description

Displays performance statistics with a dynamic update every ten seconds. The columns in the display are the defined interface names.

Example

```
SmartRoute 4.03_r          pelican          Up: 4:18:50:32
Wed Jan 17 10:39:49 1996     131.143.19.66       Idle CPU = 98%

Interface          eth0   modem0     modem1     modem2     modem3     modem4
ifOutOctets        3002   0          0          0          0          0
rawsndcnt          17     0          0          0          0          0
ifOutUcastPkts     17     0          0          0          0          0
ifOutNUcastPkts    0      0          0          0          0          0
ifInOctets         4178   0          0          0          0          0
rawrecvcnt         39     0          0          0          0          0
ifInUcastPkts      2      0          0          0          0          0
ifInNUcastPkts     37     0          0          0          0          0
Dialer state              listening  idle       listening  idle       idle
Modem speed  10000000       14400      115200 115200 115200 115200
Line load
```

```
Total in and out:    6 pps   Total async load =    0 cps
Max context switch latency = 1 ticks
```

Where

ifOutOctets	Number of bytes transmitted
rawsndcnt	Number of packets sent
ifOutUcastPkts	Number of Unicast (non-broadcast) packets
ifOutNUcastPkts	Number of broadcast packets
ifInOctets	Bytes received
rawrecvcnt	Packets received
ifInUcastPkts	Unicast packets received
ifInNUcastPkts	Broadcast packets received
Dialer state	Idle/dialing/called_in/called_out
Modem speed	Should be called port speed
Line load	The higher of in or out as a percentage of port speed

2.18 ppp

Displays the current status of the point-to-point protocol (PPP) on a specific interface. Configures an interface's various levels of protocol negotiation to support a PPP connection between local and remote peers as defined by RFC 1661.

Syntax

Interface status

ppp *i&g_iface*

Compression method selection

ppp *i&g_iface* **ccp** {**local** | **remote**} **method** [**stacker** | **history** *num* | **none** | **allow** [**on** | **off**]]

LCP negotiation

ppp *iface* **lcp** {**local** | **remote**} **accm** [*bitmap* | **allow** [**on** | **off**]]

ppp *iface* **lcp** {**local** | **remote**} **authentication** [**chap** | **pap** | **none** | **allow [on** | **off**]]

ppp *iface* **lcp** {**local** | **remote**} **acfc** [**on** | **off** | **allow** [**on** | **off**]]

ppp *iface* **lcp** {**local** | **remote**} **pfc** [**on** | **off** | **allow [on** | **off**]]

ppp *iface* **lcp** {**local** | **remote**} **magic** [**on** | **off** |*value* | **allow** [**on** | **off**]]

ppp *iface* **lcp** {**local** | **remote**} **mru** [**size** | **allow** [**on** | **off**]]

ppp *iface* **lcp** {**local** | **remote**} **default**

ppp *iface* **lcp timeout** [*seconds*]

IPCP negotiation

ppp *i&g_iface* **ipcp** {**local** | **remote**} **address** [**on** | **off** | **allow [on** | **off**]]

ppp *i&g_iface* **ipcp** {**local** | **remote**} **compress** [**tcp** *slots* [*flag*] | **none** | **allow [on** | **off**]]

IPXCP negotiation

ppp *i&g_iface* **ipxcp** {**local** | **remote**} **compress** [**cipx** [*slots* [*flag*]] | **none** | **allow** [**on** | **off**]]

ppp *i&g_iface* **ipxcp** {**local** | **remote**} **network** [**on** | **off** | **allow [on** | **off**]]

ppp *i&g_iface* **ipxcp** {**local** | **remote**} **node** [**on** | **off** | **allow** [**on** | **off**]]

ppp *i&g_iface* **ipxcp** {**local** | **remote**} **default**

Authentication of users

ppp *i&g_iface* **chap user** *username* [*password*]

ppp *i&g_iface* **pap user** *username* [*password*]

Description

The Router uses industry-standard PPP as defined by RFC 1661 to transfer data over WAN interfaces, for example, **modem*X*** and **sync*X***.

When a point-to-point connection is established between Router routers and/or other routers, or peers, several layers of negotiation must occur between local and remote ends. This negotiation process defines a mutually acceptable configuration for data to transfer between *peer_local* and *peer_remote*. Negotiation layers defined for each interface are:

- Link control protocol (LCP)
- IP control protocol (IPCP) see RFC 1332
- IPX control protocol (IPXCP) see RFC 1552
- Password authentication protocol (PAP) see RFC 1334
- Challenge handshake authentication protocol (CHAP) see RFC 1334

The *ppp* command configures a specific interface's layers of negotiation. It also displays the current configuration of a specific interface.

NOTE

The ppp command is inherently complex because of its wide variety of negotiation options. Unless you have detailed knowledge of PPP, we recommend you consult with Technical Support before changing default PPP configurations. Defaults are configured when you first install the Router.

The most common reason a Router user may issue the *ppp* command is to disable CHAP authentication so the Router can communicate with another vendor's router. Other variations of *ppp* require more detailed knowledge of the PPP protocol. Refer to the PPP RFC 1661 for more information.

Before the negotiation process can take place between *peer_local* and *peer_remote*, the following events must occur:

- first a physical connection must be established—a phone call, leased line, or ISDN call
- once the physical connection is established, each end (*peer_local* and *peer_remote*) must exchange LCP packets to configure and test their connection

- once connection tests pass, each end must pass authentication
- once authentication passes, PPP must send packets to select and configure one or more *network-layer protocols*, IP and IPX
- once network-layer protocols are selected and configured properly, data can finally be sent over the connection.

The following section, *Syntax*, lists the various *ppp* command syntax configurations. The next section *Subcommands and parameters*, organizes the syntax and appropriate parameters according to the command set in which they belong.

Syntax

Several categories of command syntax are listed next:

- current status of an interface
- commands to configure the layer control protocol (LCP) negotiation
- commands to configure the IP control protocol (IPCP) negotiation
- commands to configure the IPX control protocol (IPXCP) negotiation
- commands to change names and passwords that authenticate the Router to its peers

A PPP peer may refuse to negotiate a parameter altogether by using *allow off*. In general, we recommend you do not set *allow off* with the *remote* subcommand. There is no requirement that both ends of a PPP connection be Routers, only that the remote PPP peer support RFC1661 PPP.

Subcommands and parameters

Several subcommands use common parameters. Instead of repeating the global parameters for each subcommand, the most common parameters and options are listed here.

Global parameters:

iface Physical interface:

- **modem0-4—**one of 5 possible modems
- **sync0—**the synchronous port

i&g_iface Physical interface:

- **modem0-4—**one of 5 possible modems
- **sync0—**the synchronous port

{**local** | **remote**} For each *ppp* command you must select between local and remote.

local—A peer has absolute control over what it receives by setting its local values.

remote—Set remote values to suggest to a remote peer what it will receive. Remote values suggested from the other end are taken into consideration during negotiation, but may be refused by the receiving peer. In general, we recommend you do not send an allow off with the remote subcommand.

allow [**on** | **off**] Activates a feature's negotiation.

on—the specified value will be negotiated

off—the specified value will not be negotiated

2.18.1 Interface Status

ppp *i&g_iface*

Current status of an interface - With no other parameters, the **ppp** *iface* command issued as shown above displays the current PPP status of the interface *iface* you specify.

2.18.2 Compression Method Selection

ppp *i&g_iface* **ccp** {**local | remote**} **method**
[**stacker | history** *num* **| none | allow** [**on | off**]]

method—Displays or sets the compression method used for outgoing packets on the Router.

stacker—Selects the Stacker™ algorithms to be used to compress outgoing packets.

history *num***—**Compression can be turned on with history, or without history. **History 1** turns on compression; **history 0** turns off compression. Compression without history compresses each packet based upon that packet only. Compression with history compresses packets based upon the packet itself, and previous types of packets. History allows the box to be more efficient when handling packets that are identical.

none—Selects no compression to be used on outgoing packets.

2.18.3 LCP Negotiation

ppp *iface* **lcp** {**local | remote**} **accm**
[*bitmap* **| allow** [**on | off**]]

Displays or sets the desired Asynchronous Control Character Map (ACCM).

bitmap Specify the bitmap in octets. The default is *0xffffffff.*

ppp *iface* **lcp** {**local | remote**} **authentication**
[**chap | pap | none | allow [on | off**]]

Displays or sets the authentication protocol. The default is *none*. Use *local* when you want the remote end to authenticate itself using the specified protocol. Use *none* when the remote end does not have to authenticate itself.

Use *remote* to suggest to the remote end that you authenticate yourself to it using the specified protocol or by suggesting that you not authenticate yourself at all if none was set. The remote end is free to ignore your suggestion. The acceptable authentication protocols are CHAP and PAP. The *challenge handshake authentication protocol* verifies the identity of a peer using a three-way handshake when establishing a link. The *password authentication protocol* verifies the identity of a peer using a two-way handshake when establishing a link. Because passwords are sent over the circuit in a text format (unencrypted), PAP is not as secure as CHAP.

chap Selects *challenge handshake authentication protocol*

pap Selects *password authentication protocol*

none No authentication occurs when the point-to-point connection establishes a link. This is the default setting.

NOTE

If authentication fails after a config modify has been executed, make sure you verify the config modify with a config show. If you see more than one ppp modem0 chap user xxx yyy display for your remote interfaces with the old Router name and password, you must manually delete them with the following commands:

```
ppp modem0 chap user none
ppp isdn0 chap user none
config save
```

ppp *iface* **lcp** {**local** | **remote**} **acfc**
[**on** | **off** | **allow** [**on** | **off**]]

Address and control field compression (ACFC)—Displays or sets the option to compress the address and control fields of the PPP header. The default is **off**.

ppp *iface* **lcp** {**local** | **remote**} **pfc**
[**on** | **off** | **allow** [**on** | **off**]]

Protocol field compression (PFC)—Displays or sets the option to compress the address and control fields of the PPP header. By default the setting is **off**, so that all implementations must transmit packets with two-octet PPP protocol fields. When using low-speed links, it is desirable to conserve bandwidth and avoid sending redundant data. PFC controls the trade-off between implementation simplicity and bandwidth redundancy.

ppp *iface* **lcp** {**local** | **remote**} **magic**
[**on** | **off** |*value* | **allow** [**on** | **off**]]

Magic number - Displays or sets the initial magic number, to provide a method of detecting links in the looped-back state and other Data Link Layer anomalies. By default the magic number is **off**, or not negotiated, and zero is inserted where a magic number may otherwise be used. Choose the magic number in the most random manner possible in order to guarantee a very high probability that it is unique. Good ways to choose a random magic number include using machine serial numbers, network addresses, etc. Until the magic number is successfully negotiated it must be transmitted as zero.

value Enter the value you want to be the magic number.

ppp *iface* **lcp** {**local** | **remote**} **mru**
[*size* | **allow** [**on** | **off**]]

Maximum receive unit (MRU)—Displays or sets the maximum receive unit (MRU), the largest packet that a PPP peer is willing to receive. It is expressed in two octets and sent to inform the peer that the implementation can receive larger packets.

size—The default value is 1500 octets. If smaller packets are requested, an implementation still must be able to receive the full 1500 octet information field in case link synchronization is lost.

ppp *iface* **lcp** {**local** | **remote**} **default**

Default—Issuing this command verbatim resets the lcp negotiation options to their default values, as specified by RFC1661. Default values are:

- ACCM - 0xffffffff
- ACFC - off
- authentication - none
- Magic number - off - not negotiated
- MRU - 1500 octets
- PFC - two-octet fields
- timeout - 3 seconds

ppp *iface* **lcp timeout** [*seconds*]

Timeout—Sets the timeout interval.

seconds—Displays or sets the interval to wait between LCP configuration or termination attempts. The default is 3 seconds.

2.18.4 IPCP Negotiation Subcommands

ppp *i&g_iface* **ipcp** {**local** | **remote**} **address**
[**on** | **off** | **allow** [**on** | **off**]]

local address.enables or disables negotiation of the local address. By default, no addresses are negotiated. Allows a Router to either request that the remote end set the IP address by putting 0.0.0.0 as the local address or to suggest the remote end allow the Router to set its IP address by configuring a non-zero remote address.

NOTE

You can specify the local address using the ifconfig command. The default local IP address is the address set with the "ip address" command.

ppp *i&g_iface* **ipcp** {**local** | **remote**} **compress**
[**tcp** *slots* [*flag*] | **none** | **allow** [**on** | **off**]]

TCP compression—Displays or sets the local or remote TCP compression options. The default is that compression is on and that the number of slots is 16 and the flags default to 0. In addition, non-compression can be specified for the local or suggested for the remote side.

slots default is **16**.
flag default is **0**.

2.18.5 IPXCP Negotiation

ppp *i&g_iface* **ipxcp** {**local** | **remote**} **compress**
[**cipx** [*slots* [*flag*]] | **none** | **allow** [**on** | **off**]]

IPX compression—Displays or sets the local or remote IPX compression options. By default compression is on, the number of slots is 16 and the flags default to 0. In addition, non-compression can be specified for the local or suggested for the *remote* side.

slots default is **16**.

flag default is **0**.

ppp *i&g_iface* **ipxcp** {**local** | **remote**} **node**
[**on** | **off** | **allow** [**on** | **off**]]

IPX node number—Displays or sets whether the local or remote IPX node number is announced to the other side or not. Also sets whether to allow a local or remote node number from the remote side.

ppp *i&g_iface* **ipxcp** {**local** | **remote**} **default**

ipxcp configuration settings—Change the selected interface's ipxcp configuration settings back to their defaults. Defaults are provided for each subcommand.

2.18.6 Authentication of Users

ppp *i&g_iface* **chap user** *username* [*password*]

ppp *i&g_iface* **pap user** *username* [*password*]

Displays or sets *username* to be sent when the peer requests that your Router to authenticate itself. The password to be sent may be set, but not displayed. When the *username* is specified, but no password is supplied, the *passwd* file is searched for the password. This command overrides the default name which is the system name, and the default password, which is the link password set in the *config* session. The username and password may be different for the CHAP and PAP authentication protocols.

username Set the username. Default is the system name.

password Set the password. Default is the link password set in the config session.

Examples

ppp commands are not required for typical use of the Router. The most common use of the **ppp** commands is to turn off the CHAP authentication protocol. Other commands require a more detailed knowledge of the PPP protocol and are not recommended for use without such knowledge. For example:

ppp modem0 lcp local auth none

This command sets the authentication type to **none**. The other choices are **pap** and **chap**.

Users often set the authentication type to **none** to examine the WAN link and then turn authentication back on (**chap** or **pap**) once they are satisfied that the link is functioning properly.

The following commands are often used to connect to an Ascend router's modem. Check the parameters set on the Ascend router before using these commands. Note that the commands listed below must be issued on both sides of the connection for proper configuration:

ppp modem0 lcp local accm 0xa0000
ppp modem0 lcp local acfc off
ppp modem0 lcp local pfc off
ppp modem0 pap user *user_acct pwd*

2.19 ps

Displays the status of running processes

Syntax

ps

Description

The command *ps* displays the total time the router has been up and information about all of the currently running processes. It displays:

`PID`	process ID
`SP`	current stack pointer
`stksize`	amount of stack space used
`maxstk`	maximum amount of stack space available
`event`	address of the event a process is waiting for if it is not able to run
`fl`	the process status and the name of the process that is currently operating.

The status flags are indicated by a sequence of three letters, for example, IWS:

`I`	Processes that are waiting with interrupts enabled. Usually indicates processes not waiting for a hardware interrupt.
`W`	Processes waiting for an event (the event value should be non-blank).
`S`	Suspended processes.

NOTE

Many commands may cause more than one process to execute. There is not a one-to-one correspondence between any command/function and processes.

Example

Uptime 10:05:22:22 Stack 6236 max intstk 57

PID	SP	stksize	maxstk	event	fl	name
4f630008	50270156	250	105	4f770046	IW	display
50510010	50ba01da	256	46	50510010	IW	gcollect
52c00010	56d001ca	256	151	427ba719	IW	com1monitor
52220010	522901c2	250	42	427ba108	W	keyboard
52ba0008	56f001dc	256	64	427ba6f8	IW	com1 tx
52c70008	556e0232	320	84	427ba6d8	W	com1 receive
57310010	573901bc	256	116	4f7700b2	IW	FTP listener
4f5b0010	507a03dc	512	46	427b9e2e	IW	killer
4f710008	4d341f4c	0	0	4f770010	IW	cmdintrp
52ab0010	571101ba	256	117	4f77007c	IW	Telnet listener
579b0010	575903b2	512	258	50690036	IW	com1 dialup
515b0010	51620a86	1536	530		I	network
504b0008	50db07d6	1024	186			timer
52620010	62360f20	2048	322		I	Telnet Server

2.20 reboot

Drop all connections and restart the Router

Syntax

reboot

Description

reboot is a cold-restart mechanism that gracefully drops all open connections and restarts the router. A user prompt is displayed on the screen; verification is needed before reboot is initiated. When rebooted, the router responds as if the power was started and stopped by restarting the Router internal self tests and reloading the system software.

2.21 start/stop

Start or stop a server

Syntax

start {**discard** | **echo** | **ftp** | **rip** | **snmp** | **telnet**}

stop {**discard** | **echo** | **ftp** | **rip** | **snmp** | **telnet**}

Description

Starts or stops a server. Initiates/ends server processes. The user may use the *ps* command to determine which server processes are running.

Subcommands and parameters

start {**discard** | **echo** | **ftp** | **rip** | **snmp** | **telnet**}

stop {**discard** | **echo** | **ftp** | **rip** | **snmp** | **telnet**}

discard—Specifies that any packets sent to the discard port will/will not be discarded. Use *start* to discard; *stop* not to discard.

echo—Specifies that any packets sent to the echo port will/will not be echoed back to the sender. Use *start* to echo back; *stop* not to echo back.

ftp—Starts/stops the ftp server process. The FTP server is used to upload and download files to the router startup disk.

rip—Starts/stops the rip server process.

snmp—Starts/stops the snmp server process. Used by clients to obtain network statistics and manage the Router.

telnet—Starts/stops the telnet server process. Allows administrators to log in remotely.

2.22 tip

Establishes a connection with an interface

Syntax

tip *iface*

Description

Using a terminal program, the *tip* command establishes a full-duplex terminal connection to a modem interface. It is a diagnostic tool used to manually send commands to a modem. Normally this command is only used to test new modem configuration options.

NOTE

The tip command is only used on modem interfaces. Do not use tip on a modem that has a dialer running.

Before using *tip* on a modem line, the line dialer must be stopped with the **dialup iface inactive** command.

Subcommands and parameters

tip *iface*

Establish a full duplex connection to a modem interface.

iface **modem0-4**

2.23 trace

Send packet-type status (for an interface) to the console.

Syntax

trace *iface* [**in** | **out** | **hex** | **ppp** | **packet** | **up** | > *filename*]

Description

The *trace* command enables packet tracing on a given interface (*iface*) to standard output. The default is to display input and output packet headers. Packet headers are fully decoded up through the transport level. Packet data is displayed as ASCII characters and periods representing unprintable characters.

NOTE

If you are logged in on an interface, you are not allowed to trace that interface.

Subcommands and parameters

trace *iface* [**in** | **out** | **hex** | **ppp** | **packet** | **up** | > *filename*]

iface	**eth0, modem0-4, sync0**
in	Limit traces to packets received on the interface.
out	Limit traces to packets sent by the interface.
hex	Add an additional hex dump to the output.
ppp	Include PPP packets in the trace.
packet	Include all packet types in the trace.
up	Displays the packets keeping the WAN link active.
> *filename*	Sends trace data to the file *filename*.

2.24 tux

(TCP under IPX) Provides status of all TCP under IPX connections.

Syntax

tux status

Description

This command helps determine the amount of traffic passing through the connection, and shows the last time data was sent or received. The figures compiled by the report are cumulative.

Subcommands and parameters

tux status

Example

The report issued by the *tux* command has the following columns:

From	The IPX address sending the packets
Sent-Pkt	Total number of packets sent
Rcvd-Pkt	Total number of packets received
Last Rcvd	Date last packets were received

2.25 update

Synchronize the local and remote networks

Syntax

update [*iface*] **now**

update [*iface*] **init** [{**on** | **off**}]

update [*iface*] **periodic** [[+] *time1* [*time2* [*time3* [*time4*]]]]

update [*iface*] **timeout** [*mins*]

Description

The *update* command forces a periodic connection to the site at the other end of the specified *iface*. This allows IPX protocol tables, like the routing (RIP) and Service (SAP) tables, to be exchanged between the two sites. After the timeout time *mins*, the line disconnects. The default is not to periodically connect at all.

For all subcommands, if the *iface* parameter is not specified, all WAN interfaces are updated. To configure Router to automatically update all WAN ports when the system starts, use the *update iface init on* command. To disable this feature, use the *update iface init off* command.

Subcommands and parameters

iface Interfaces:

- **modem0-4** - one of 5 possible modems
- **sync0** - the synchronous port

update [*iface*] **now**

To immediately connect the two sites, use *update now*. This command is normally given after the Router is first installed, to synchronize the local and remote sites. For example, enter *update modem0 now*.

update [*iface*] **init** [{**on** | **off**}]

Each time the Router starts, it attempts to connect the two sites at each end of its defined interfaces by automatically issuing the *update init* subcommand. To configure Router to automatically update all WAN ports when the system starts, use the *update iface init on* command. To disable this feature, use the *update iface init off* command.

on—Configures Router to automatically update all WAN ports when the system starts. This is the default setting.

off—Disable the update of all WAN ports when the Router starts.

update [*iface*] **periodic** [[+] *time1* [*time2* [*time3* [*time4*]]]]

To periodically connect to a remote site at a fixed time interval, use the *update periodic* subcommand with the +time1 parameter defined, indicating the time interval. For example, to connect to the remote site on *modem0* every four hours, enter *update modem0 periodic +0400*. The Router then connects to the remote site every four hours after this command is issued. To remove this interval, use a *time1* of 0.

To connect to the remote site at specific times during the day, specify the exact times to connect, in 24-hour format (hhmm). Up to four times may be specified. For example, to connect to the remote site on modem0 at 4 a.m., 12 p.m., 4 p.m., and 8 p.m., enter *update modem0 periodic 0400 1200 1600 2000*.

+—If the first time is preceded by a plus (+) sign, the following three times specified are ignored.

time1—If you specify a value in the *time1* parameter preceded by a plus (+) sign, then it becomes the interval of time at which a connection is attempted. If you do not specify a + before the value, *time1* becomes the first time during the day a routine connection is attempted. Use the 24-hour format (*hhmm*).

time2, time3, time4 If no + is entered before *time1*, then *time2, time3* and *time4* are the following three times when a routine connection is attempted. If a + is specified, then these values are ignored. All time parameters are cleared when the update command is issued. To change the second, third or fourth time, the preceeding times must be re-entered.

update [*iface*] **timeout** [*mins*]

To set the amount of time (in minutes) to leave the connection open, use the *update timeout* subcommand. This is crucial for timing out remote users on NetWare networks. This time must be greater than the longest *user timeout* used in a NetWare server. To compute a NetWare server's *user timeout*, use the following formula:

NetWare Server's User Timeout =

*(Delay Before First Watchdog Packet) + (Number of Watchdog Packets) * (Delay Between Watchdog Packets)*

If the *update timeout* is not long enough, remote users who have restarted or turned their machine power off may not be cleared from central-site NetWare servers. They may stay logged in forever. The default timeout is 10 minutes.

mins The timeout value in minutes. The default timeout is 10 minutes.

2.26 version

Display the Router's software release number

Syntax

version

Description

The *version* command displays the software release number of the Router.

2.27 who

Displays information about who is logged onto the Router.

Syntax

who

Description

The *who* command displays the *login name, terminal name, login time*, and *network address* for each LAN, user or client currently logged onto your Router. *Who* also shows login information for authenticated remote systems currently logged on. For a remote system (client or LAN), negotiated IP and IPX interface addresses are also shown.

LANs, users or clients logged onto the Router who are configured to *not require authentication*, do not appear in the *who* report.

Example

```
who
root  net   Apr 27 11:11   131.33.12.20) telnet
root  net   Apr 27 11:25   131.33.12.09) ftp
arrow modem0 Apr 27 11:30 IP Addr: 131.143.16.1 IPX Addr 1222.0.0
guest modem2 Apr 27 13:05 IP Addr: 131.33.12.15 IPX Addr 1333.0.0
```

3. IPX-only commands

The Router is always in one of two modes. The prompt always indicates the current mode:

- (ipx)Router> *Router is in IPX mode*
- (tcp/ip)Router> *Router is in TCP/IP mode*

The commands in this chapter are for IPX mode only, supporting IPX network environments. Commands which operate the same way in both IPX and TCP/IP environments are documented in **Chapter 2, Generic Commands**. Commands for TCP/IP mode only are documented in **Chapter 4, TCP/IP-only Commands**. Several commands operate in both IPX and TCP/IP modes with parameters that vary per mode. These commands are documented with their appropriate parameters in both chapters.

From IPX mode, either use the **tcp/ip** command to enter TCP/IP mode or prefix the command with "TCPIP."

IPX-only commands are organized in this chapter alphabetically:

- filter -filter ipx packets
- ifconfig -display or change IPX network parameters
- ipx -display or change IPX protocol parameters
- netstat -display IPX network statistics

- ping -send an ICMP packet to remote host
- ripfilter -filter RIP packets using the RIP filter list
- route -display and change IPX routing tables
- sap -display and change SAP routing tables
- sapfilter -filter IPX packets using the SAP filter list
- spoof -configure/display which packets to spoof
- tcp/ip -change to TCP/IP mode

Before listing the commands alphabetically, the following general information is provided:

- IPX addresses
- Interface addresses
- Reserved destination socket numbers
- IPX server types
- IPX packet types

3.1 Interface Addresses

The *iface*[*/frame_type*] parameters indicate the interface and frame type. *iface* is specified as one of the following, depending on your Router model: **eth0, sync0, modem0, modem1, modem2, modem3,** or **modem4**. If **eth0** is selected, the *frame_type* can be specified as part of the interface, and can be either **802.3, 802.2, SNAP** or **II** (for Ethernet Type 2). Use a slash to separate the *iface* from the *frame_type*—for example, **eth0/802.2**. If left unspecified, the default *frame_type* is **802.3**.

For the Ethernet interface, the *iface* parameter is a string of the form *eth0/frame_type*. For all other interfaces, *iface* is of the form *modemX*. Examples are:

`ethN`	Ethernet N interface, raw 802.3 frame type
`ethN/802.3`	Ethernet N interface, raw 802.3 frame type
`ethN/II`	Ethernet N interface, Ethernet Type II frame type
`ethN/SNAP`	Ethernet N interface, 802.3 SNAP frame type
`ethN/802.2`	Ethernet N interface, 802.3 LLC frame type
`modem N`	Modem N interface; modems are numbered from 0 to 4, depending on your Router model. See the *User's Guide* (in the front of this manual) for details.
`sync0`	Synchronous interface (Sync Router only)

3.2 IPX Addresses

IPX addresses uniquely identify a particular node on an IPX network. IPX addresses are represented as:

net.node.socket

net—Uniquely identifies an IPX network with a number. This IPX network number is specified in 8-digit hexadecimal format. The range of valid IPX network numbers for Router command-line parameters is **1 to fffffffe**. The IPX network number 0 is reserved for this network and should not be used in any Router commands. The IPX network number **ffffffff** is reserved for broadcast and should not be used in any Router commands.

node—Represents the Media Access Control (MAC) protocol address of an IPX node. For Ethernet, it is the Ethernet address. The node number is a 12-digit hexadecimal number.

socket—A 4-digit hexadecimal number in the range of 1 to fffe. The socket specifies the process within a router or NetWare server to which a packet will be sent. Leading zeros are not required. Missing fields default to zero, which implies a wild-card condition.

Example IPX addresses

```
3.00801b0271ee.453
```

Packets with this destination address will be sent to IPX network 3, Ethernet address 00:80:1b:02:71:ee, RIP process socket 453.

```
1993.02cf1f800022.452
```

Packets with this destination address will be sent to IPX network 1993, Ethernet address 02:cf:1f:80:00:22, SAP process socket 452.

3.3 Reserved Destination Socket Numbers

The destination socket field contains the socket number of the packet's destination process. Sockets are used to route packets to different processes within a single node. Table B-1 lists the reserved socket numbers in NetWare:

Table B-1. Reserved Destination Socket Numbers.

Socket Number	Socket Process
0451h	NetWare Core Protocol process (NCP)
0452h	Service Advertising Protocol process (SAP)
0453h	Routing Information Protocol process (RIP)
0455h	Novell NetBIOS process
0456h	Diagnostics process
4000h-7FFFh	Dynamic Sockets: used by workstations
8000h-FFFFh	Assigned by Novell

To use socket numbers above 8000h, you must contact Novell and obtain assignments. No broadcast socket numbers are allowed in IPX.

3.4 IPX Server Types

Novell assigns each type of server a unique server type, which is specified by a number. Although IPX routers use SAP, they do not typically act as servers and do not require assignment of a server type. **Table B-2** lists some typical server types.

Table B-2. Typical IPX Server Types.

Server Type Number	Server Type
0000h	unknown
0003h	print queue
0004h	file server
0005h	job server
0007h	print server
0009h	archive server
0024h	remote bridge server
0047h	advertising print server
8000h	reserved up to
FFFFh (-1)	wildcard

3.5 IPX Packet Types

The packet type indicates the type of service offered or required by the packet. **Table B-3** list the packet types defined in NetWare.

Table B-3. IPX Packet Types.

Field Value	Packet Type	Description
00h	unknown	for all unclassified packets
01h	routing information	for RIP packets
04h	service advertising	for SAP packets
05h	sequenced	for SPX packets
11h	NetWare core protocol	for NCP packets
14h	PP (propagated packet)	for Novell NetBIOS

3.6 filter

Filter IPX packets using the general filter list

Syntax

filter add *name*{ [**-i** *iface* [*/frame_type*]]
[**-s** *src_addr*]
[**-d** *dest_addr*]
[**-p** *pkt_type*] }
{**-t** {**allow** | **deny** | **nodial**}
[**-f** {**inbound** | **outbound**}]
[**-o** {**before** | **after**} *existing_name*]

filter delete *name*
filter {**enable** | **disable**}
filter flush
filter move *name* [{**before** | **after**} *existing_name*]
filter status

Description

Use packet filtering to make your Router more secure, or to decrease throughput. The filters allow IPX traffic to be selectively restricted to and through the Router. You can also use filters to keep hosts outside of your organization from initiating calls on your phone line and increasing your phone bills. There are three IPX filter lists:

- General (**filter** command)
- RIP (**ripfilter** command)

- SAP (**sapfilter** command)

Packets are checked for filter matches using those three lists in the order: general list, RIP list, SAP list. The Router software can be configured to specify:

- an include list (packets to forward)
- an exclude list (packets not to forward)

The filter list entries can specify

- IPX source and destination addresses
- IPX packet types
- direction
- Router interface
- RIP and SAP parameters

Use the *filter* command to configure and modify IPX packet filters. If enabled, all incoming and outgoing IPX packets can be filtered using IPX filters. Filtering must first be enabled for the list entries to take effect.

Filtering restrictions apply to packets destined for the Router and those routed through the Router. The result of passing a packet to the Filtering Module is a decision to allow or deny further processing of the packet. The next hop is not considered.

The filtering is based on a prioritized list of filter expressions. Filter expressions are added to the Router through use of the *filter*, *ripfilter* and *sapfilter* commands. The action specified in the first filter expression found in the filter list that matches the packet in question is applied.

All IPX filtering is disabled by default. Filtering takes effect when the *enable* command for a filter list (General, RIP or SAP) is entered by the user. Filter list entries stay in place across reboots only if the *config save* command is entered before restarting.

There is no notion of filter modes. The filter list can be a mix of allowed and denied address/protocol/port/interface/flag/direction specifications.

The default action if no match is found is to allow the packet. You can override this by specifying a filter expression with wildcard address entries as the lowest-priority filter expression.

Subcommands and parameters

filter add *name*

The *filter add* subcommand adds an IPX packet filter of name *name*.

name—A 1 to 6 character ASCII identifier chosen by the user to easily reference filter expressions. Each filter expression must have a unique name. This name is generally used so that the position of an entry in the list can be changed. Names beginning with a dollar sign ("$") are reserved for use by the system.

[[+]**-i** *iface* [*/frame_type*]]—Specify a legal interface

iface—**eth0, modem0-4, sync0**

frame_type—Specified as part of the interface, and can be either **802.3, 802.2, SNAP** or **II** (for Ethernet Type 2). Use a slash to separate the *iface* from the *frame_type*, for example, **eth0/802.2**. If left

unspecified, the default *frame_type* is **802.3**.

[**-s** *src_addr*]—Specify source address

src_addr—Specify the source address field of the IPX header. These include the network, node and socket numbers. Specify these three numbers as hexadecimal numbers, separated by periods, as follows: *network.node.socket*. Leading zeros are not required. Use the keyword **any** as a wild card for either node or socket number. Missing fields default to zero, which equates to a wild-card condition (matches everything).

[**-d** *dest_addr*]—Specify destination address.

dest_addr—Specify the destination address field of the IPX header. These include the network, node and socket numbers. Specify these three numbers as hexadecimal numbers, separated by periods, as follows: *network.node.socket*. Leading zeros are not required. Use the keyword any as a wild card for either node or socket number. Missing fields default to zero, which equates to a wild-card condition (matches everything).

[**-p** *pkt_type*]}—Specify packet type.

pkt_type. Specify the type of packet in the packet field in the IPX header. Specify this parameter as a hexadecimal number (**00-FF**), or as one of the following names: **unknown**, **RIP, SAP, SPX, NCP, PPP**. If this argument is not specified, then it is assumed to be **0**, which implies all packet types.

{**-t** {**allow | deny | nodial**}— Specify type of filters to be used.

allow—allows any packet that matches the filter specification to pass through.

deny—drops any packet that matches the filter specification.

nodial—only drops packets that cause the destination interface to dial. Otherwise, the packet is passed on. Use this option to prevent hosts outside the organization from initiating a call on your phone line and causing unnecessarily expensive phone bills.

[**-f** {**inbound | outbound**}]—Specify direction of traffic flowing.

Filter entries may be created to restrict inbound traffic, outbound traffic, or traffic flowing in both directions. The default value is both.

[**-o** {**before | after**} *existing_name*]—Specify order, and thus priority, of filters in the list.

The default position is at the end. The first entry is highest priority.

filter delete *name*

The filter delete subcommand deletes the specified IPX filter name.

`name` Deletes the specified general IPX filter name.

filter {**enable | disable**}

Enables or *disables* IPX packet filtering. Filtering is disabled when the unit starts and must be explicitly enabled.

filter flush

Deletes all general IPX packet filters.

filter move *name* [{**before | after**} *existing_name*]

Enables you to relocate a filter entry *name* in the filter list, to a place *before* or *after* an existing filter entry *existing_name*. If no *[before | after...]* clause is given, then the entry is placed last in the list. To change a filter's priority, simply move it in the list.

filter status

Displays the list of general IPX packet filters.

Example

Add a filter to allow only SAP packets (socket 452) to pass through.

filter add fs1 **-s** any.any.452 **-t allow**

filter add fs2 **-d** any.any.452 **-t allow -o after** fs1

filter add fs3 **-s** any.any.any **-d** any.any.any **-t deny -o after** fs2

See also

ripfilter

sapfilter

3.7 ifconfig

Configure/display IPX network interface parameters

Syntax

ifconfig [*iface* [*/frame_type*] [**network** *net_number*] [{**up** | **down**}]]

ifconfig *iface* [**speed** [*bps*]]

ifconfig [*iface* [**linkaddr** *directory_number* [*/SPID*]]

Description

The *ifconfig* command is used to assign an IPX network number to a network interface or to enable or disable IPX routing on a network interface. *ifconfig* is used to define the network number of each frame type on each ethernet interface present on the router. The modem interfaces are each initialized to a unique net number and do not need to be initialized; however, you can use *ifconfig* to change the network address of modem interfaces. Used without options, *ifconfig* displays the current IPX configuration of all interfaces.

NOTE

An Ethernet interface can be configured to run multiple frame types simultaneously. A unique net number must be assigned for each frame type on each interface.

Subcommands and parameters

ifconfig [*iface* [*/frame_type*] [**network** *net_number*] [{**up** | **down**}]]

Assigns network characteristics to the interface specified, including *frame type*, **network**, and *network*

number.

iface **eth0, modem0-4, sync0**

/ frame_type The frame type you want to assign to the interface. Legal frame types are:

- 802.3
- 802.2
- SNAP
- II (for Ethernet Type 2)

Use a slash to separate the *iface* from the *frame_type*—for example, **eth0/802.2**. If left unspecified, the default *frame_type* is **802.3**.

net_number—If *net_number* is not present, the current net number for the interface is displayed. If *net_number* is present, specify *net_number* as the IPX network number of this interface. You cannot change the network number unless the interface is marked **down**.

The *net_number* is specified as a hexadecimal number with range **0** to **FFFFFFFE**. Leading zeroes are optional. A net number between **1** to **FFFFFFFE** must be entered before the iface interface can be brought up. A net number of **0** will "unset" the network number on this interface.

up—Enable IPX routing on this interface. When an Ethernet interface is enabled, a route to the interface is entered in the route table and the router will send out RIP and SAP requests for latest information. For a modem interface, no route is added and no RIP or SAP requests will be made until a connection occurs. *ifconfig* never causes a modem to dial. You cannot bring up an interface with a "0" network number (unset).

down—Disable IPX routing on this interface. All routing and Service Table entries which point out through this interface are deleted. IPX packets will not be routed through this interface.

ifconfig *iface* [**speed** [*bps*]]

iface—modem0-4, sync0

speed—The *speed* subcommand allows you to change the speed of the connection between the Router and its modem, sync, and ISDN interfaces.

bps—bits per second. Typical choices are **38400** bps for V.34 modem interfaces, **57600** bps for synchronous interfaces, and **115200** bps for ISDN interfaces.

3.8 ipx

Displays or configures IPX protocol parameters

Syntax

ipx broadcast
ipx internal_net [*internal_net_number*]
ipx optimize [**on** | **off**]
ipx priority
ipx routing [{**enable** | **disable**}]
ipx spx

ipx trace

Description

The *ipx* command allows you to display or configure parameters to control the IPX protocol. Entering any of the commands without options or parameters displays the current state.

Subcommands and parameters

ipx broadcast—Displays the current status (on or off) of ipx broadcast.

ipx internal_net [*internal_net_number*]

*internal_net_number***—**Displays or sets the current IPX internal network number. If no *internal_net_number* is entered, the Router displays the current network number. During start-up, the Router initializes the IPX internal network number to a unique value based upon the address of the Ethernet interface (range **1** to **FFFFFFFE**).

ipx optimize [**on | off**]

on—Enables you to configure the Router to minimize unnecessary dialing on NetWare networks. This command loads a set of filters that eliminate unnecessary dialing caused by NetBIOS/IPX, NetWare Time Synchronization, NetWare Directory Services, and SPX applications.

off—Disables this feature.

ipx priority—Displays the current status (on or off) of **ipx** priority.

ipx spx—Displays the current status (on or off) of **ipx spx** optimization.

ipx routing [{**enable | disable**}]

enable—Enables IPX routing on the Router. The default value is enabled.

disable—Disables IPX routing on the Router.When IPX routing is disabled, no IPX packets are allowed through any interface. If IPX routing is disabled, the Router will still route IP traffic.

ipx trace—Displays the current status (on or off) of ipx trace.

Example

```
ipx internal_net bf4d021b
```

This sets the internal net number to bf4d021b.

3.9 netstat

Show IPX network statistics

Syntax

netstat [-m] [-p {ipx | rip | sap | pburst] [-s]

Description

Use the *netstat* command to display IPX protocol statistics.

Subcommands and parameters

-m—Display memory statistics: amount of free memory, number of failed memory allocations, number

of memory errors, and network usage statistics. These statistics are useful when troubleshooting problems.

-p—ipx—Display IPX protocol statistics, including running counter values such as total number of packets sent and received, number of bad packets received, time-outs, etc.

rip—Display RIP protocol statistics, including running counter values such as total number of packets sent and received, number of bad packets received, time-outs, etc.

sap—Display SAP protocol statistics, including running counter values such as total number of packets sent and received, number of bad packets received, time-outs, etc.

pburst—Display NetWare packet burst statistics. Detects and tracks packet burst errors. If any errors occur, the *server name* and *user address* are reported. This helps locate and reconfigure NetWare clients. Packet burst error messages display on the console four times daily maximally.

Statistics include running counter values such as total number of packets sent and received, number of bad packets received, timeouts, etc.

-s—Display summary IPX statistics.

3.10 ping

Send an IPX diagnostic packet to see if a remote Router, NetWare server, or NetWare client is operating properly.

Syntax

ping *server_name*
ping *router_name*
ping *network.node_address*
ping -s {*server_name* | *router_name* | *network.node_address*}
ping -s {*server_name* | *router_name* | *network.node_address*} *count*

Description

Use *ping* to send an IPX diagnostic packet to the destination you specify. If the destination responds to the diagnostic packet, then the round trip time displays in milliseconds. If the destination does not respond, then the message *No response from destination_name* displays on the console.

The *server_name* or *router_name* must appear in the Router's SAP table. To see the list of available Routers and servers:

1. Enter **sap** from the *ipx* command prompt.
2. Enter ***ping destination_name*** as it appears in the Routers SAP list. The *destination_name* parameter is not case-sensitive.

Subcommands and parameters

ping *server_name*

server_name—The server name to which you wish to verify a connection. This name must appear in

the Router's SAP table.

ping *router_name*

router_name—The Router to which you wish to verify a connection. This name must appear in Router's SAP table.

ping *network.node_address*

network.node_address—The node address to which you wish to verify a connection.

ping -s *{server_name | router_name | network.node_address}*

server_name—The server name to which you wish to verify a connection. This name must appear in the Router's SAP table.

router_name—The Router to which you wish to verify a connection. This name must appear in Router's SAP table.

network.node_address—The node address to which you wish to verify a connection.

ping -s *{server_name | router_name | network.node_address} count*

server_name—The server name to which you wish to verify a connection. This name must appear in the Router's SAP table.

router_name—The Router to which you wish to verify a connection. This name must appear in Router's SAP table.

network.node_address—The node address to which you wish to verify a connection.

-s—sends the IPX diagnostic packet continuously.

count—sends the number of IPX diagnostic packets that you specify in count.

3.11 ripfilter

Filter RIP packets using the RIP filter list

Syntax

ripfilter add *name* { [**-i** *iface* [*/frame_type*]]
[**-q** *query_type*]
[**-n** *network*] }
-t {**allow | deny | nodial**}
[**-f** {**inbound | outbound**}]
[**-o** {**before | after**} *existing_name*]
[**-h** {*hopcount*}]

ripfilter delete *name*
ripfilter {**enable | disable**}
ripfilter flush
ripfilter move *name* [{**before | after**} *existing_name*]
ripfilter status

Description

Use the *ripfilter* command to configure and modify RIP filters. If enabled, all incoming and outgoing RIP packets are filtered through RIP filters. There are three IPX filter lists:

- General (**filter** command)
- RIP (**ripfilter** command)
- SAP (**sapfilter** command)

Packets are checked for filter matches using these three lists in the order: general list, RIP list, SAP list.

Filtering restrictions apply to packets destined for the Router and those transitioning through the Router. The result of passing a packet to the filtering module is a decision to allow or deny further processing of the packet. The next hop is not considered.

Filtering is based on a prioritized list of *filter expressions* or FEs. Filter expressions are added to the Router through use of the *filter, ripfilter* and *sapfilter* commands. The action specified in the first filter expression found in the Filter list that matches the packet in question is applied.

All IPX filtering is disabled by default. Filtering takes effect when the *enable* command for a filter list (General, RIP, or SAP) is entered by the user. Filter-list entries stay in place across reboots only if the *config save* command is entered before restarting.

There is no notion of filter modes. The filter list can be a mix of allowed and denied *address/protocol/port/interface/flag/direction* specifications.

The default action if no match is found is to allow the packet. A user can override this by specifying a filter expression with wildcard address entries as the lowest priority filter expression.

Subcommands and parameters

ripfilter add *name*

Adds an RIP packet filter of name *name*.

name—A 1- to 6-character ASCII identifier chosen by the user to easily reference filter expressions. Each filter expression must have a unique name.

[**-i** *iface* [*/frame_type*]]—Specify a legal interface. See the general description of interfaces at the beginning of this chapter for more information.

iface—**eth0, modem0-4, sync0**

frame_type—Specified as part of the interface, and can be either **802.3, 802.2, SNAP** or **II** (for Ethernet Type 2). Use a slash to separate the iface from the *frame_type*, for example, eth0/802.2. If left unspecified, the default *frame_type* is **802.3**.

[**-q** *query_type*]—Specify the type of query.

query_type—Enter either **request** or **response**. If the *query_type* is not specified, it is assumed to be both, for example, request and response.

[**-n** *server_name*]}—Specify the server name.

server_name—Name the server using an ASCII string of up to 48 characters. If *server_name* is not specified, then it is assumed to be null (any server name).

-t {allow | deny | nodial}

Specify the type of filter to be used.

allow—Allows any packet that matches the filter specification to pass through the router.

deny—Drops packets that matches the filter specification.

nodial—Only drops packets that would make the destination interface dial. Otherwise, the packet is passed on. Use filters to keep hosts outside of your organization from initiating calls on your phone line and increasing your phone bills.

[-f {inbound | outbound}]

Specify whether the filter applies to incoming or outgoing packets. If neither parameter is specified, then the filter applies to both types of packets.

inbound—incoming packets.

outbound—outgoing packets.

[**-o** {**before | after**} *existing_name*]

Change the order of filters in the filter list. If nothing is specified then the filter is inserted at the end of the list.

before—insert the filter before *existing_name*.
after—insert the filter after *existing_name*.
*existing_name—*Enter a filter name already in the RIP filter list.

[**-h** {*hopcount*}]—Specify a hops limit:

Places a limit on the number of IPX router hops visible to the Router. This can be used on large networks as a security feature to limit access from branch offices to a small area on the your local network. The **sap** command shows server names and the number of hops required to get to a particular server. Note the server name and the number of hops. See the first example.

ripfilter delete *name*

Deletes the specified filter.

name—A 1 to 6 character ASCII identifier chosen by the user to easily reference filter expressions. Each filter expression must have a unique name.

ripfilter {enable | disable}

Enables or disables RIP packet filtering. RIP packet filtering is disabled when the unit starts and must be explicitly enabled.

ripfilter flush

Deletes all RIP packet filters.

ripfilter move *name* [{**before | after**} *existing_name*]

Enables you to change the order of RIP packet filters in the filter list. If no [**before | after...**] clause is given, then the entry is placed last in the list.

*name—*The name whose position you want changed in the filter list.

before—Insert the filter name before existing_name. If before or after are not specified then the filter is inserted at the end of the list.

after—Insert the filter name after existing_name. If before or after are not specified then the filter is inserted at the end of the list.

existing_name—Enter a filter name already in the list.

ripfilter status

Displays the list of RIP packet filters.

Example #1

On the headquarters Router enter:

> **sap**

to display:

```
Type            Name        Interface        Address          Hops        Flg
FILE SERVER     SALES       eth0/802.3 1234.0000001          2     P
```

Next, enter:

ripfilter -h 2 -i eth0/802.3 -t deny -f inbound

With the above configuration, the branch office network will not be able to see more than two router hops past the Router. This enhances headquarters security and reduce the RIP traffic over the modem link to improve network performance.

Example #2

Add a filter called *rip1* which denies all inbound RIP packets on the Ethernet 802.3 interface. Enter:

ripfilter add rip1 -i eth0 -f inbound -t deny

See also

filter

sapfilter

3.12 route

Manipulate and display the IPX routing tables

Syntax

For modem interfaces only

route add *dest_net iface* [*metric*] [*ticks*]

For Ethernet interfaces only

route add *dest_net iface*[*/frame_type*] *router_addr* [*metric*] [*ticks*]

For any interface

route

route broadcast *iface*[*/frame_type*] [{**enable | disable**}]

route -f

route delete *dest_net*

route update *iface*[*/frame_type*] [{**enable** | **disable**}]

Description

Adding and deleting IPX routes is unnecessary in all but the most unusual of circumstances. Normally, the Router software will learn the routes by communicating with other routers and servers on the network, and the software will maintain valid routing tables without user intervention.

Routes that are added by hand using the **route** command are called "static" routes, while the "RIP" routes are those routes that are learned automatically by the Router.

Routes added using the **route add** subcommands override any existing RIP routes. In those circumstances the RIP routes become the secondary routes. The system administrator should be sure that the route being added is correct.

Often there is more than one way to get to a destination. When multiple routes to a destination exist, the best route is selected as the "primary" route and all other routes are determined to be the "secondary" routes. Secondary routes are not displayed with the **route** command. When primary routes are deleted using the **route delete** command, a secondary route becomes the primary route.

Subcommands and parameters

For modem interfaces only

route add *dest_net iface* [*metric*] [*ticks*]

Adds routes that send packets out of a modem interface.

dest_net—Network address of the destination machine. Enter it as a hexadecimal number with range 1 to FFFFFFFE.

iface—**modem0-4, sync0**

metric—The number of hops to the destination. Typically this is the number of additional routers the packets must pass through to get to the destination. The maximum value is **16**, while the default is **1**.

ticks—The amount of time that a packet will take to get to the dest_net. Specify ticks in sixtieths of a second. Default values are Ethernet interface=1, modem interface=5 and synchronous interface=10.

For Ethernet interfaces only

route add *dest_net iface*[*/frame_type*] *router_addr* [*metric*] [*ticks*]

Adds routes that send packets out of an Ethernet interface.

dest_net—Network address of the destination machine. Enter it as a hexadecimal number with range 1 to FFFFFFFE.

iface—**eth0**

/ frame_type—Specified as part of the interface, and can be either **802.3, 802.2, SNAP** or **II** (for Ethernet Type 2). Use a slash to separate the *iface* from the *frame_type*, for example, eth0/802.2. If left

unspecified, the default *frame_type* is **802.3**.

router_addr—The Ethernet address of the next hop router to which packets should be sent. The *router_addr* parameter must always be specified for Ethernet interfaces. Enter the *router_addr* as six sets of two-digit hexadecimal numbers, separated by colons (":").

metric—The number of hops to the destination. Typically this is the number of additional routers the packets must pass through to get to the destination. The maximum value is **16**, while the default is **1**.

ticks—The amount of time that a packet will take to get to the *dest_net*. Specify ticks in sixtieths of a second. Default values are Ethernet interface=**1**, modem interface=**5**, and synchronous interface=**10**.

For any interface

route

Use *route* without a subcommand to display all routes listed in the Router's Route Table. Each route's parameters are displayed in seven columns:

```
Network    Interface   Router/Next Hop    Hops   Ticks    Timer    Flags
```

- *Network*—These parameters are the network number,
- *Interface*—The interface used by the route,
- *Router*—The node number of the next hop,
- *Next Hop*—The number of hops to the remote network,
- *Ticks*—The number of "ticks" to the remote network,
- *Timer*—The current age in seconds of the route, and
- *Flags*—One or more flags describing the route. The "ticks" indicate approximately how long it takes to reach the network. The Route Table flags are:

P—Primary route—All routes will have this flag.

N—New primary route—This route was learned since the last RIP update.

A—Ageless route—The route is currently not being aged.

S—Static route—This route was manually added using the **route add** subcommand.

route broadcast *iface*[*/frame_type*] [{**enable** | **disable**}]

Allows the user to enable the sending of periodic RIP broadcasts over the specified interface.

iface—**eth0, modem0-4, sync0**

/ frame_type—Specified as part of the interface, and can be either 802.3, 802.2, SNAP or II (for Ethernet Type 2). Use a slash to separate the *iface* from the *frame_type*—for example, **eth0/802.2**. If left unspecified, the default frame_type is 802.3.

enable—If enabled, broadcasts are sent.

disable—If disabled, broadcasts are not sent.

route -f

Flushes or deletes all RIP routes in the route table. During a flush, static routes are not removed. To

delete a static route, use the **route delete** command and specify the desired route explicitly. Flushing the route table does not turn off the Router's ability to learn new routes. Using RIP, the Router will re-learn all routes that other routers are advertising on the network, over a period of time.

route delete *dest_net*

Deletes a route to *dest_addr*, the network address of the destination network. Enter *dest_addr* as a hexadecimal number. If the route being deleted was a static route (added by hand), then any existing secondary route will become the new primary route to that destination network.

route update *iface*[*/frame_type*] [{**enable** | **disable**}]

Similar to the *route broadcast* subcommand, but instead controls the sending of RIP updates (when the IPX route table changes).

iface—**eth0, modem0-4, sync0**

/ frame_type—Specified as part of the interface, and can be either **802.3, 802.2, SNAP,** or **II** (for Ethernet Type 2). Use a slash to separate the *iface* from the *frame_type*—for example, **eth0/802.2**. If left unspecified, the default *frame_type* is **802.3**.

enable—If enabled, broadcasts are sent.

disable—If disabled, broadcasts are not sent.

Examples

To add a route through the first modem interface to a server on network 12, 5 hops away with the default number of ticks, enter:

route add 12 modem0 5

To add a route out of the Ethernet interface to a server on network 2F, with the next hop *router_addr* having an Ethernet address of 02CF1F302018 and frame type of Ethernet Type 2 (II), also with metric of 6 and ticks equal to 15, enter:

route add 2F eth0/II 02:CF:1F:30:20:18 6 15

To delete the two routes previously added, enter:

route delete 12

route delete 2F

An example of the **route** command's output format:

Network	Interface	Router/Next	Hops	Ticks	Timer	Flags
*00002111	eth0/802.3	02cf1f800013	1	2	0	PAS
BRANCH00000bac	eth0/802.3	00001b27ba4b	2	3	7	P
(internal ppp)2204801f	modem0	000000000000 1	11	0	PS	
*00001111	modem0	740109154a4b	2	12	46	P
JUSTIN2f24f387	modem0	740109154a4b	3	13	46	P
MAIN2cc6f6ca	modem0	740109154a4b	3	13	46	P
*00002222	modem0	740109154a4b	3	13	46	P
*00003333	modem0	740109154a4b	3	13	46	P

*00004444	modem0	740109154a4b	3	13	46	P
*00000008	modem0	740109154a4b	3	13	46	P
*00000009	modem0	740109154a4b	3	13	46	P
*0000000a	modem0	740109154a4b	3	13	46	P
*0000000b	modem0	740109154a4b	3	13	46	P
*00000de2	modem0	740109154a4b	4	23	46	P
*00000201	modem0	740109154a4b	4	23	46	P

(* = LAN Network Number)

3.13 sap

Manipulate and display the IPX service table

Syntax

sap

sap add *name iface* [*/frame_type*] *server_type server_addr* [*hops*]

sap broadcast *iface* [*/frame_type*] [{**enable** | **disable**}]

sap delete *name*

sap -f

sap roundrobin [{**on** | **off**}]

sap update *iface* [*/frame_type*] [{**enable** | **disable**}]

Description

Use the *sap* command to manage the IPX service entries, which the Router software maintains and keeps in the IPX service table, also called the service table. The IPX service table is used by clients to determine what services, such as file servers or print servers, are available on the remote network. The Router supports all service types defined by Novell.

Adding and deleting IPX service-table entries is usually unnecessary. Normally the software running in the Router will learn about service-table entries by communicating with servers and other routers on the network, and will maintain valid service tables *without* user intervention.

Service -table entries that are added by hand using the *sap* command are called "static" entries to distinguish them from "dynamic" entries, which are learned automatically by the Service Advertising Protocol (SAP) software that runs in the Router. Service-table entries added using the *sap* command can replace previously learned SAP entries. The system administrator should be sure that a service-table entry added manually is correct.

There are sometimes cases where there is more than one way to use a service. An example of such a case is when a file server supports more than one frame type. When multiple ways to use a service exist, the concept of "secondary" Service table entries is used. In certain circumstances, secondary Service table entries are used when primary entries are deleted using the *sap delete* command.

Subcommands and parameters

sap

Issue the *sap* command without parameters to display the contents of the Router's service table. The routes are displayed in six columns:

```
Name      Type  Interface  Address    Hops  Flg
```

- *Name*—SAP name,
- *Type*—SAP type,
- *Interface*—Router interface,
- *Address*—IPX address,
- *Hops*—The number of hops to the SAP,
- *Flg*—Some flags describing the SAP. The flags are:

P—Primary SAP. All routes will have this flag.

N—New primary SAP. This route was learned since the last SAP update.

A—Ageless SAP. This route is currently not being aged.

S—Static SAP. This route was manually added using the *sap add* subcommand.

sap add *name iface* [*/frame_type*] *server_type server_addr* [*hops*]

Use the *sap add* command with parameters to add static entries to the IPX service table.

name—The name assigned to the server. Specify *name* as an ASCII string up to 48 characters long.

iface—**eth0, modem0-4, sync0**

/frame_type—Specified as part of the interface, and can be either **802.3, 802.2, SNAP** or **II** (for Ethernet Type 2). Use a slash to separate the *iface* from the *frame_type*—for example, **eth0/802.2**. If left unspecified, the default *frame_type* is **802.3**.

server_type—Type of server to be added, and is entered as either a valid text string or a hexadecimal number in the range 0-FFFF. Valid text strings include:

Unknown, Print_queue, File_server, Job_server, Print_server, Archive_server, Remote_bridge_server, Advertising_print_server

server_addr—The IPX address of the server. This address is specified as *net.node.socket.*

hops—The number of additional routers packets must traverse to get to the specified server. The hops maximum value is **16**, with its default value set to **1**.

sap broadcast *iface* [*/frame_type*] [{**enable** | **disable**}]

The *sap broadcast* subcommand allows the user to enable sending periodic SAP broadcasts over the specified interface. If enabled, the broadcasts are sent. If not enabled, the broadcasts are not sent.

iface—**eth0, modem0-4, sync0**

frame_type—Specified as part of the interface, and can be either **802.3, 802.2, SNAP** or **II** (for Ethernet Type 2). Use a slash to separate the *iface* from the *frame_type*, for example, eth0/802.2. If left unspecified, the default *frame_type* is **802.3**.

enable—If enabled, broadcasts are sent.

disable—If disabled, broadcasts are not sent.

sap delete *name*

The *sap delete* subcommand deletes a Service Table entry.

name—The name of the service to be deleted. If the entry being deleted was added by hand (i.e. is a static entry), then any existing secondary entry will become the new primary entry to the service. Specify *name* as an ASCII string up to 48 characters long.

sap -f

Flushes the Service Table. All dynamic SAP entries will be removed from the Service Table. Static entries must be deleted explicitly by using sap delete. Note that flushing the Service Table does not turn off the Router's ability to learn about services. Over time the Router may re-learn all services that other routers are advertising on the network, through the use of SAP.

sap roundrobin [{on | off}]

Without any arguments displays the status of the roundrobin feature, that is, on or off.

{on | off}—Controls Get Nearest Server responses generated from the Router.

on—Roundrobin on is useful when the client machine doesn't care which available server is used, or when it is desirable to distribute the workload over multiple servers.

off—Roundrobin off is useful when you want to limit which server is used.

You cannot assume that a particular server will be used when there are multiple servers in use, regardless of the state of the roundrobin parameter. When a client desires to use one specific server, use the NetWare *preferred server* option on your client to explicitly specify the server.

In NetWare, a client machine broadcasts a "Get Nearest Server" request, asking for the location of the closest server of a particular type. Typically this is a file server, although any type of server supported by Netware is possible. In the case that several servers are equally close (same number of hops and transport time), the router may return any of the equally-close servers. The Router actually returns the server it learned about first when there are multiple equally-close servers. Turning roundrobin on changes this, so that the Router will return a different nearest server each time it is queried for nearest server and there are equally-close servers. When there is one or more servers on the local net, the Router will not return any information about the nearest server. The local servers themselves will respond.

sap update *iface* [*/frame_type*] [{**enable | disable**}]

sap update is similar to *sap broadcast*, with the exception that it controls sending SAP updates (when the IPX SAP table changes).

iface—**eth0, modem0-4, sync0**

frame_type—Specified as part of the interface, and can be either **802.3, 802.2, SNAP,** or **II** (for Ethernet Type 2). Use a slash to separate the *iface* from the *frame_type*—for example, **eth0/802.2**. If left unspecified, the default *frame_type* is **802.3**.

enable—If enabled, broadcasts are sent.

disable—If disabled, broadcasts are not sent.

Examples

The sap output format follows:

Name	Type	Interface	Address	Hops	Flags

remote	Router	eth0/802.3	00002111.02CF1F800013.87BE	1		PA
RNS	NDS	eth0/802.3	00000BAC.000000000001.4006	2		P
BRANCH	NW 386	eth0/802.3	00000BAC.000000000001.8104	2		P
BRANCH	FILE SERVER	eth0/802.3	00000BAC.000000000001.0451	2		P
hq	Router	modem0	00001111.02CF1F800022.87BE	3		P
JUSTIN	FILE SERVER	modem0	2F24F387.000000000001.04513		P	
RNS	NDS	modem0	2CC6F6CA.000000000001.4006	3		P
RNS	NTS	modem0	2CC6F6CA.000000000001.0005	3		P
MAIN	NW 386	modem0	2CC6F6CA.000000000001.8104	3		P
MAIN	FILE SERVER	modem0	2CC6F6CA.000000000001.0451	3		P
rolo	Router	modem0	00001111.00801B027488.87BE	3		P
Hollis	Router	modem0	00001111.00801B02742B.87BE	3		P
nmstest	Router	modem0	00001111.00801B024DD7.87BE	3		P

3.14 sapfilter

Filter SAP (service advertising protocol) packets using the SAP filter list

Syntax

sapfilter add *name* { [**-i** *iface*[*/frame_type*]]
[**-q** *query_type*]
[**-s** *server_type*]
[**-n** *server_name*] }
-t {**allow** | **deny** | **nodial**}
[**-f** {**inbound** | **outbound**}]
[**-o** {**before** | **after**} *existing_name*]
[**-h** {*hopcount*}]
sapfilter delete *name*
sapfilter {**enable** | **disable**}
sapfilter flush
sapfilter move *name* [{**before** | **after**} *existing_name*]
sapfilter status

Description

The Service Advertising Protocol (SAP) exchanges services information between IPX routers and Novell servers. Use the sapfilter command to configure and modify filters for SAP packets. If enabled, all incoming and outgoing SAP packets can be filtered through SAP filters.

There are three IPX filter lists:

- General (**filter** command)
- RIP (**ripfilter** command)
- SAP (**sapfilter** command)

Packets are checked for filter matches using those three lists in that order. Filtering restrictions apply to packets destined for the Router and those transitioning through the Router. The result of passing a packet to the filtering module is a decision to allow or deny further processing of the packet. The next

hop is not considered.

The filtering is based on a prioritized list of filter expressions. Filter expressions are added to the Router through use of the **filter**, **ripfilter**, and **sapfilter** commands. The action specified in the first filter expression found in the Filter list that matches the packet in question is applied.

All IPX filtering is disabled by default. Filtering takes effect when the enable command for a filter list (General, RIP or SAP) is entered by the user. Filter list entries stay in place across restarts only if the **config save** command is entered before restarting.

There is no notion of filter modes. The Filter list can be a mix of allowed and denied address/protocol/port/interface/flag/direction specifications.

The default action if no match is found is to allow the packet. You can override this by specifying a filter expression with wildcard address entries as the lowest-priority filter expression.

Subcommands and parameters

sapfilter add *name*

Adds a SAP packet filter you name and assigns it the options and parameters specified below:

name—A 1- to 6-character ASCII identifier chosen by the user to easily reference filter expressions. Each filter expression must have a unique name.

{[**-i** *iface* [*/frame_type*]]—Specify a legal interface.

iface—**eth0, modem0-4, sync0**

/frame_type—Specified as part of the interface, and can be either **802.3, 802.2, SNAP,** or **II** (for Ethernet Type 2). Use a slash to separate the *iface* from the *frame_type*—for example, **eth0/802.2**. If left unspecified, the default *frame_type* is **802.3**.

[**-q** *query_type*]—Specify the type of query.

query_type—Enter either request or response. If the query_type is not specified, it is assumed to be both, request and response.

[**-s** *server_type*]—Specify the type of server.

server_type—indicates the type of server in the SAP packet on which to filter. Specify the *server_type* as a hexadecimal number (**1 to FFFF**). The *server_type* can also be specified as one of the following keywords: **Wild, Unknown, Print Queue, File_server, Job_server, Print_server, Archive_server, Remote_bridge_server, or Advertising_print_server**. If no *server_type* is specified, then all server types are used.

[**-n** *server_name*]}—Specify the server name.

server_name—Name the server using an ASCII string of up to 48 characters. If *server_name* is not specified, then it is assumed to be null (any server name).

[**-f** {**inbound | outbound**}]

Specify whether the filter applies to incoming or outgoing packets. If neither parameter is specified, then the filter applies to both types of packets.
inbound—incoming packets.
outbound—outgoing packets.

-t {allow | deny | nodial}—Specify the type of filter to be used.

allow—Allows any packet that matches the filter specification to pass through the router.

deny—Drops packets that matches the filter specification.

nodial—Only drops packets that would make the destination interface dial. Otherwise, the packet is passed on. Use filters to keep hosts outside of your organization from initiating calls on your phone line and increasing your phone bills.

[-o {before | after} *existing_name*]

Change the order of filters in the filter list. If **before** or **after** is not specified, then the filter is inserted at the end of the list.

before—insert the filter before *existing_name*.

after—insert the filter after *existing_name*.

existing_name—Enter a filter name already in the list.

[**-h** {*hopcount*}]—Specify a hops limit

Places a limit on the number of IPX router hops visible to the Router. This can be used on large networks as a security feature to limit access from branch offices to a small area on the your local network. Use *ripfilter -h*, if possible.

sapfilter delete *name*

Deletes the specified filter.

name—A 1- to 6-character ASCII identifier to reference a SAP filter entry you wish to delete.

sapfilter {enable | disable}

Enables or disables SAP packet filtering. SAP packet filtering is disabled on startup and must be explicitly enabled.

enable—Enable SAP packet filtering.

disable—Disable SAP packet filtering. This is the default condition.

sapfilter flush

Deletes all SAP packet filters.

sapfilter move *name* [{**before | after**} *existing_name*]

Enables you to change the order of packet filters in the SAP filter list. If you do not specify *before* or *after*, then the entry is placed last in the list.

name—The name of the filter you want to move.

before—Optional. Move *name* to the position in the list before *existing_name*. If you do not specify, *name* is moved to the end of the list.

after—Optional. Move *name* to the position in the list after *existing_name*. If you do not specify, *name* is moved to the end of the list.

existing_name—Optional. The name of the filter in the filter list **before** or **after** which you want to position *name*, the filter you want to move. If you do not specify, *name* is moved to the end of the list.

sapfilter status

Displays the list of SAP packet filters.

Example

Add a filter called "sap1" to allow only file server services (service type 4) received from eth0 to be routed. Create a second filter called "sap2" which denies all other inbound packets. Enter:

sapfilter add sap1 -s 4 -f inbound -i eth0 -t allow

sapfilter add sap2 -i eth0 -f inbound -t deny -o after sap1

See also

filter

ripfilter

3.15 spoof

Configure/display which packets to spoof

Syntax

spoof *iface* **watchdog** [{**on** | **off**}]

Description

The *spoof* command configures which packets to spoof. Spoofing is the act of responding to periodic packets received on the Ethernet interface while a corresponding modem interface is disconnected. If the Router allowed the packets through, the modem interface would never disconnect. Spoofing is usually performed for packets that are periodically sent between the local and remote networks. The Router default is to enable spoofing for all modem interfaces. Any interface (line) configured for client operation will automatically have the spoof watchdog *off* for that interface.

Subcommands and parameters

Only "non-Ethernet" interfaces are allowed for *iface*.

iface—**modem0-4, sync0**

on—Specifies that spoofing is enabled for a given interface. Enabling watchdog spoofing allows remote users to not lose their NetWare server connection at the other end of the modem link, when the modem line disconnects. If the modem disconnects, the user can simply access the server volume again, the modem will redial, and the session will continue, after a 30- to 60-second delay to make the modem connection.

off—Specifies that spoofing is disabled for a given interface. If neither on nor off is specified, then the current state of spoofing is returned. If watchdog spoofing is disabled, then each time the modem disconnects (usually due to an idle modem line), the user's connection will time out at the server. NetWare servers generally time out lost user connections after 10 minutes, although this time is configurable. After the timeout, the server closes the user's files and logs the user out. If the user accesses the NetWare server again, the user's machine will hang, an error message will be displayed, the application may abort, and the user will have to log back onto the server.

3.16 tcp/ip

Change the Router mode to TCP/IP

Syntax

tcp/ip [*tcp/ip_command* [*param*]...]

Description

When in IPX mode, use the *tcp/ip* command to enter the TCP/IP mode. The Router is always in one of two modes, and the prompt always indicates the mode:

(tcp/ip)Router> *Router is in TCP/IP mode*
(ipx)Router> *Router is in IPX mode*

The protocol mode is set on a per-session basis. Individually logged in users can have different modes set. Depending upon what mode it is in, the Router software selects the command set and help/usage strings available to the user for the current mode (protocol).

You can also execute a command from a different mode by prefixing the command with the mode. For example, to dump the TCP/IP routing table while in IPX mode, at the prompt enter

(ipx)Router> **tcp/ip route**

This command will switch to the TCP/IP mode, execute the **route** command, and then return to the IPX mode.

4. TCP/IP-only Commands

The Router is always in one of two modes. The prompt always indicates the current mode:

- `(ipx)Router>` *Router is in IPX mode*
- `(tcp/ip)Router>` *Router is in TCP/IP mode*

The commands in this chapter are for TCP/IP mode only for TCP/IP network environments. Commands which work the same way in both IPX and TCP/IP environments are documented in **Chapter 2**. Commands for IPX mode only are documented in **Chapter 3**. Several commands operate in both IPX and TCP/IP modes with parameters that vary per mode. These commands are documented with their appropriate parameters in both chapters.

From TCP/IP mode, either use the **ipx** command to enter IPX mode or use the prefix "ipx" with the command.

TCP/IP-only commands are organized in this chapter alphabetically:

- arp—display or change ARP protocol parameters
- domain—configure for Internet domain name service (DNS)
- filter—configure/display TCP/IP filter information
- icmp—display ICMP protocol status
- ifconfig—display or change TCP/IP network parameters
- ip—display or change TCP/IP protocol parameters
- ipx—change to IPX mode
- netstat—display TCP/IP network statistics
- ping—send an ICMP packet to remote host
- rip—display or change RIP protocol parameters
- route—display or change TCP/IP routing table
- snmp—display or change SNMP protocol parameters
- syslog—display or configure system log
- tcp—display or configure TCP protocol parameters
- traceroute—trace the route to a host
- udp—display UDP protocol status

4.1 Interface Addresses

The *iface*[*/frame_type*] parameters indicate the interface and frame type. *iface* is specified as one of the following, depending on your Router model: **eth0, sync0, modem0, modem1, modem2, modem3,** or **modem4**. If **eth0** is selected, the *frame_type* can be specified as part of the interface, and can be either **802.3, 802.2, SNAP,** or **II** (for Ethernet Type 2). Use a slash to separate the *iface* from the *frame_type*—for example, **eth0/802.2**. If left unspecified, the default *frame_type* is **802.3**.

For the Ethernet interface, the *iface* parameter is a string of the form *eth0/frame_type*. For all other interfaces, *iface* is of the form *modemX*. Examples are:

`ethN`—Ethernet N interface, raw 802.3 frame type

`ethN/802.3`—Ethernet N interface, raw 802.3 frame type

`ethN/II`—Ethernet N interface, Ethernet Type II frame type

`ethN/SNAP`—Ethernet N interface, 802.3 SNAP frame type

`ethN/802.2`—Ethernet N interface, 802.3 LLC frame type

`modem N`—Modem N interface; modems are numbered from 0 to 4, depending on your Router model. See the *User's Guide* (at the front of this manual) for details.

`sync0`—Synchronous interface (Sync Router only)

4.2 arp

Configure/display address-resolution-protocol information

Syntax

arp

arp [*host_addr*]

arp -a

arp -d *host_addr*

arp -f

arp -p [{**on** | **off**}]

arp -s *host_addr ether_address* [**pub**]

Description

The *arp* command displays and modifies the Internet-to-Ethernet address translation tables used by the address resolution protocol (ARP).

If an illegal option is entered, the usage line is displayed.

Subcommands and parameters

arp—Display the entire ARP table.

arp [*host_addr*]—Display the current ARP entry of a host.

host_addr—The address of the host whose ARP table you want displayed.

arp -a—Display all current ARP entries.

arp -d *host_addr*—Delete an entry for a host.

host_addr—The address of the host whose ARP table entry you want deleted.

arp -f

Flush the temporary entries in the ARP table. Permanent entries are not affected. Temporary entries are entries learned dynamically. Permanent entries are entered through the User Interface or SNMP.

arp -p—Display the status of proxy ARP.

arp -p [{**on** | **off**}]

Change the status of proxy ARP.

on—Enable proxy ARP.

off—Disable proxy ARP. This is the default.

arp -s *host_addr ether_address* [**pub**]

Create an ARP entry for the host specified by its host and Ethernet addresses.

host_addr—The address of the host for which you will create an ARP entry.

ether_address—The Ethernet address of the host. The Ethernet address has six hexadecimal digits separated by colons.

pub—Optional. If specified, the ARP entry is published. The system will respond to ARP requests for *host_addr* even though the host address is not its own.

4.3 domain

Configure the Internet Domain Name Service (DNS)

Syntax

domain addserver *host_addr* [*host_addr...*]
domain dropserver *host_addr* [*host_addr...*]
domain listservers
domain query *host_addr*
domain retry [*count*]
domain suffix [*domain_suffix*]
domain cache list
domain cache size [*count*]

Description

The **domain** command configures the Internet Domain Name Service. This is used to map Internet addresses to a more familiar textual name.

Subcommands and parameters

domain addserver *host_addr* [*host_addr...*]

Adds the Internet address to the router list of domain name servers.

host_addr—The Internet address of the device being added to the list.

domain dropserver *host_addr* [*host_addr...*]

Removes one or several devices from the router list of domain name servers.

host_addr—The Internet address(es) of the device(s) being removed.

domain listservers

Displays the router list of domain name servers.

domain query *host_addr*

Displays all resource records associated with the host.

host_addr—The Internet address of the host whose resource records you wish to view.

domain retry [*count*]

Set or display the number of times a hostname lookup is attempted before giving up.

count—Maximum number of lookups allowed.

domain suffix [*domain_suffix*]

Set or display the default suffix to add to a domain name when the name contains no suffix.

domain_suffix—The default suffix to add to domain. If this parameter is omitted, the current suffix is displayed.

domain cache list

Display the current cache of domain names that have been found.

domain cache size [*count*]

Set or display the current number of domain names that the cache can hold.

count—Enter the maximum number of domain names. If this parameter is omitted, the current setting is displayed.

4.4 filter

Configure/display IP filter information

Syntax

filter add *name* { [**-s** {[*src_addr/bits*] [*src_port*]}]
[**-d** {[*dest_addr/bits*] [*dest_port*]}]
[**-p** *proto*]
[**-l** [{**syslog** | **trap** | **both**}]]
[**-i** *iface*]

[**-f** {**inbound** | **outbound**}]}
-t {**allow** | **deny** | **nodial** | **unreach**}
[**-o** {**before** | **after**} *existing_name*]

filter delete *name*
filter {**enable** | **disable**}
filter flush
filter move *name* [{**before** | **after**} *existing_name*]
filter spoof *iface* [{**allow** | **deny**}] [**syslog**] [**trap**]
filter status
filter try *src_addr* [**-s** *port*] *dest_addr* [**-d** *port*] [**-p** *proto*]

Description

The *filter* command configures or displays the Internet Protocol (IP) filters.

Subcommands and parameters

filter add *name*

The *filter add* subcommand adds filter expressions (FEs) to a list that is stored in prioritized order, with the first position assigned the highest-priority filter expression. Incoming and outgoing datagrams are checked against the entry in the highest-priority position first.

Several options to the *filter add* subcommand exist. Options, variables, and parameters are described next. It is important to note that one of the following options is required:

-s, -d, -p, -l, -i, or **-f**

If an option has no default, and is not specified in the filter entry, no match is attempted for that field.

filter add *name*

name—A 1 to 6 character ASCII identifier chosen by the user to easily reference filter expressions. Each filter expression must have a unique name. Names beginning with a "$" are reserved for system use (as IP "firewall" filter names).

[**-s** {[*src_addr/bits*] [*src_port*]}]

Set the source address and length of the subnet mask:

src_addr/bits—Specify the source address and the significant number of high-order contiguous bits used as a subnet mask to attempt matches. If no bits are specified, a default mask of 32 bits is assumed.

src_port—Specify the source port. The keyword any may be entered for *src_addr* or *src_port*. When *src_addr* is any, a mask should not be specified, so that a wildcard condition may be applied to source and destination addresses.

The *src_port* can be omitted (i.e. any port will match), a single 16-bit unsigned (decimal) number, a number followed immediately by "+" (meaning *nnn*-**65535**), or two numbers joined by a dash (for example, **6000-6063**) meaning that range, with 6000 and 6063 also included.

[**-d** {[*dest_addr/bits*] [*dest_port*]}]

Set the destination address and/or destination port.

dest_addr/bits—Specify the destination address and the significant number of high-order contiguous bits used as a subnet mask to attempt matches. If no bits are specified, a default mask of 32 bits is assumed.

dest_port—Specify the destination port. The keyword any may be entered for destination address or destination port. When the destination address is **any**, a mask should not be specified, so that a wildcard condition may be applied to source and destination addresses.

The *dest_port* can be omitted (i.e. any port will match), a single 16-bit unsigned (decimal) number, a number followed immediately by "+" (meaning ***nnn*-65535**), or two numbers joined by a dash (for example, **6000-6063**) for a range, with **6000** and **6063** also included.

[**-p** *proto*]—Set the protocol type.

proto—Specify an integer greater than 0 and less than 65536. In addition to numbers, keywords can also be used:

ICMPRED—The protocol field contains 1 and the ICMP subtype field is "redirect."

TCPNEW—The protocol field contains 6 and the TCP flags field contains the SYN bit but not the ACK bit; this packet requests the opening of a new connection.

TCPESTAB—The protocol field contains 6 and the TCP flags field either contains the ACK bit or does not contain the SYN bit; i.e., this packet is not establishing a new connection.

SRCROUTE—The packet contains a source-routing option. (It matches with any protocol-field value.)

[**-l** [{**syslog** | **trap** | **both**}]]

Select logging to occur.

syslog—send warnings to syslog

trap—send SNMP traps

both—send warnings to syslog and SNMP traps

[**-i** *iface*]—Specify a single interface to which the filter applies.

The default for the *iface* is all interfaces.

iface—**eth0, modem0-4, sync0**

[**-f** {**inbound | outbound**}]

Specify the flow direction to which an entry applies.

Filter entries may be created to restrict *inbound*, *outbound*, or traffic flowing in both directions. The default value is both.

-t {**allow | deny | nodial | unreach**}

Specify the type of filter.

allow—allows any packet that matches the filter specification to pass through.

deny—drops any packet that matches the filter specification.

nodial—only drops packets that cause the destination interface to dial. Otherwise, the packet is passed on. Use this option to prevent hosts outside the organization from initiating a call on your phone line and causing unnecessarily expensive phone bills.

unreach—drops the packet and returns a "Destination Unreachable" packet to the sender.

[**-o** {**before | after**} *existing_name*]

Specifies order, and thus priority, of filters in the list.

The default position is at the end. The first entry is highest priority.

before—Position the filter expression name before the filter expression *existing_name* in the FE list.

after—Position the filter expression name after the filter expression *existing_name* in the FE list.

existing_name—The name of a filter expression currently residing in the FE priority list which you want to use to orient the placement of a new FE in the list of filter priorities.

filter delete *name*

The *filter delete* subcommand deletes the specified filter.

name—A 1- to 6-character ASCII identifier defining the unique filter entry (FE) name you wish to delete.

filter {**enable | disable**}

The *filter* {*enable | disable*} subcommand enables or disables IP packet filtering. TCP/IP packet filtering is disabled by default and must be explicitly enabled.

filter flush

The *filter flush* subcommand deletes all TCP/IP packet filters.

filter move *name* [{**before | after**} *existing_name*]

The *filter move* subcommand enables you to change the order of IP packet filters in the filter list. If no *before | after* clause is specified, the filter entry is placed last in the filter list (lowest priority).

name—A 1 to 6 character ASCII identifier to reference a filter entry (FE) you wish to move. Each FE has a unique name. A list of FEs is recorded in order of priority, with the first position assigned the highest priority. Incoming and outgoing packets are checked against the entry in the highest priority position first.

before—Position the filter expression name before the filter expression *existing_name* in the FE list.

after—Position the filter expression name after the filter expression *existing_name* in the FE list.

existing_name—The name of a filter expression currently residing in the FE priority list which you want to use to orient the placement of a new FE in the list of filter priorities.

filter spoof *iface* [{**allow** | **deny**}] [**syslog**] [**trap**]

Enable detection of packets trying to perform "IP address spoofing," which is a method of getting data forwarded out of a network, from an external location.

A packet is "IP address spoofing" if it arrives on a Router interface with a source address, that is inappropriate for that interface. For example, if a packet arrives at an external Router interface (**modem0,** etc.) with a source address that is always internal to your network (i.e., it should always be via eth0), then the packet is "IP address spoofing."

The **filter spoof** command enables the Router to ensure that an incoming packet arrives on the interface that the Router would use to send packets to the source address of that packet. Essentially, the **filter spoof** command discards packets that imply that they are sourced from one interface, but actually arrived on a different interface.

[{**allow** | **deny**}]—The **deny** option causes "IP address spoofing" packets to be discarded, and the allow option allows these packets to be forwarded. By default, spoof filters are disabled (**allow**).

[**syslog**]—The **syslog** option enables a syslog message to be generated when an "IP address spoofing" packet is detected.

[**trap**]—The trap option enables an SNMP trap to be generated when an "IP address spoofing" packet is detected.

filter status—Displays the list of IP packet filters

filter try *src_addr* [**-s** *port*] *dest_addr* [**-d** *port*] [**-p** *proto*]

Use the **filter try** command to test your filters. The **filter try** command specifies test packets that are submitted to your current filter list, and returns the result. For explanations of the parameters, refer to previous filter command descriptions.

4.5 icmp

Display ICMP protocol information

Syntax

icmp status

Description

The *icmp status* command displays the status of the Internet Control Message Protocol (ICMP), which consists of ICMP statistics such as the number of ICMP messages received of each type, the number sent, etc.

4.6 ifconfig

Name

Configure an interface

Syntax

ifconfig *iface* [**address** *addr*[*/bits*]]
[**broadcast** *addr*]
[**linkaddr** *directory_number* [*/SPID*]]
[**metric** [*hops*]]
[**mtu** *size*]
[**netmask** *mask*]
[**peer** *addr* [*/bits*]]
[**rip** [{**active** | **passive** | **off**}]]
[**speed** [*bps*]]
[{**up** | **down**}]

Description

The *ifconfig* command is used to assign an IP address to a network interface and/or to configure network interface parameters. *ifconfig* commands are generated from the Router's *config* dialogue to define the network address of each interface present on the router. It may also be used at a later time to redefine other operating parameters. Used without options, *ifconfig* displays the current configuration of all interfaces.

For the Ethernet interface, the *iface* parameter is **eth0**. For the modem interfaces, the *iface* parameter is **modem0, modem1,...modem4**, depending on the model of your Router.

Addresses are expressed in the standard Internet dotted-quad notation. If the */bits* parameter is appended to the address, then this is the number of contiguous bits that are used as a subnet netmask. If the number of bits is not specified, 32 bits are assumed as a default.

If the *iface* is currently up, you may only specify the **down** option.

Subcommands and parameters

ifconfig *iface*

iface—**eth0, modem0-4, sync0**

address *addr* [*/bits*]]

Specify the address to use for this interface. This will also add a route to the routing table for this interface.

addr—Specify address for interface

/bits—Specify the number of contiguous bits to use as a subnet mask. If the number of bits is not specified, 32 bits are assumed as a default.

[**broadcast** *addr*]

addr—Specify the address to use to represent broadcasts on the network. The default broadcast address is the address with a host part of all 1's. The address can be specified as a single hexadecimal number with a leading 0x or with a dot-notation address.

[**metric** [*hops*]]

Sets the hopcount that RIP will use for a link on the specified interface. No matter what the true hopcount is for a route, administrators typically set larger hopcount values on slower interfaces than on faster interfaces, to establish a preference for the faster interface. By default, the Router sets the hopcount on modems to 2, and to 1 for all other interfaces.

[**mtu** *size*]

Specify the maximum packet size of the interface in bytes. Packets exceeding this length will be fragmented, before forwarding them through the specified interface.

[**netmask** *mask*]

Specify how much of the address to reserve for subdividing networks into subnetworks. The mask includes the network part of the local address and the subnet part, which is taken from the host field of the address.

mask—Can be specified as a single hexadecimal number with a leading 0x or with a dot-notation address. The mask contains 1's for the bit positions in the 32-bit address which are to be used for the network and subnet parts, and 0's for the host part. The mask should contain at least the standard network portion, and the subnet field should be contiguous with the network portion. This value overrides any */bits* parameter specified in the address subcommand.

[**peer** *addr* [*/bits*]]

Specify the IP address and subnet mask bits of the PPP device at the other end of the WAN interface. This command causes a route to be added to the specified sub-network.

addr—Specify the address to use. The address can be specified as a single hexadecimal number with a leading 0x or with a dot-notation address.

/bits—Specify the number of bits reserved for the subnet mask. The default is 32.

[**rip** [{**active** | **passive** | **off**}]]

If specified for the Ethernet interface, the **active** keyword enables routing information protocol (RIP) broadcasts on the Ethernet every 30 seconds with split horizon processing, when the interface is marked "up."

active—For an *Ethernet* interface, enables RIP broadcasts on the Ethernet every 30 seconds with split horizon processing, when the interface is marked "up."

For a *WAN* interface, Sends RIP updates every 60 seconds to the WAN peer once a connection is established if specified on a WAN interface. Updates are sent with split horizon processing enabled. RIP updates will not keep a dial-up link active, and will only be sent if the other traffic is keeping the link up.

passive—Causes the Router to listen for RIP updates on the interface specified, in order to learn routes available through that interface.

off—Prevents the Router from sending any RIP updates, and causes the Router to ignore RIP updates that are received.

[**speed** [*bps*]]

speed—The speed subcommand allows you to change the speed of the connection between the

Router and its modem, sync and ISDN interfaces.

bps—bits per second. Typical choices are 38400 bps for V.34 modem interfaces, 57600 bps for synchronous interfaces, and 115200 bps for ISDN interfaces.

[{**up** | **down**}]

up—Mark an interface "up." The PPP state of point-to-point interfaces is set to "starting."

down—Mark an interface "down." When an interface is marked "down," the system will not attempt to transmit messages through that interface. If possible, the interface will be reset to disable reception as well. This action does not automatically disable routes using the interface. The PPP state of point-to-point interfaces is reset to "initialized."

4.7 ip

Configure/display IP protocol information

Syntax

ip address [*host_addr*]
ip routing [{**enable** | **disable**}]
ip rtimer [*seconds*]
ip status
ip ttl [*hops*]

Description

Use the *ip* command to configure the Internet Protocol (IP) or display its status.

Subcommands

ip address [*host_addr*]

Sets the IP address of the router. This is the address that the administrator uses when connecting to the router or determining reachability to the router.

host_addr—IP address of the router.

ip routing [{**enable** | **disable**}]

Enables or disables IP routing on the Router. If neither *enable* or *disable* is entered, the Router displays the current state of IP routing (enabled or disabled). The default value is *enabled.*

enable—Enables IP routing on the Router

disable—Disables IP routing on the Router

ip rtimer [*seconds*]

Sets or displays the IP re-assembly timeout.

seconds—The default is 30 seconds.

ip status

Displays the IP statistics such as total packets, number of bad packets, etc.

ip ttl [*hops*]

Sets or displays the IP time-to-live value placed in each outgoing IP packet.

hops—The default value for *hops* is 255.

4.8 ipx

Change to IPX mode

Syntax

ipx [*ipx_command param...*]

Description

When in TCP/IP mode, use the *ipx* command to enter IPX mode. The Router is always in one of two modes, and the prompt always indicates the current mode:

- `(ipx)Router>` *Router is in IPX mode*
- `(tcp/ip)Router>` *Router is in TCP/IP mode*

The protocol mode is set per-session. Individually logged-in users can have different modes set. Depending upon what mode it is in, the Router software selects the command set and help/usage strings available to the user for the current mode (protocol).

The user can also execute a command from a different mode by prefixing the command with the mode.

Example

For example, to display the IPX routing table while in TCP/IP mode, at the prompt enter

```
(tcp/ip)Router> ipx route
```

This command will switch to the IPX mode, execute the *route* command, and then return to the TCP/IP mode.

4.9 netstat

Display network statistics

Syntax

netstat [-a] [-s] [-r] [-m]

Description

Use the *netstat* command to display the contents of various network-related data structures in various formats, depending upon the options you select.

Subcommands and parameters

-a—Show the state of all active sockets. The display for each active socket shows the local and remote address, the send and receive queue sizes in bytes, the protocol, and the internal state of the protocol.

The possible state values for TCP sockets are as follows:

- CLOSED: the socket is not being used.
- LISTEN: Listening for incoming connections.
- SYN_SENT: Actively trying to establish connection.
- SYN_RECEIVED: Initial synchronization of the connection under way.
- ESTABLISHED: Connection has been established.
- CLOSE_WAIT: Remote shut down: waiting for the socket to close.
- FIN_WAIT_1: Socket closed, shutting down connection.
- CLOSING: Closed, then remote shutdown: awaiting ack.
- LAST_ACK: Remote shut down, then closed: awaiting ack.
- FIN_WAIT_2: Socket closed, waiting for shutdown from remote.
- TIME_WAIT: Wait after close for remote shutdown retransmission.

-s—Show per-protocol statistics. For each protocol type, a complete set of statistic counters is displayed. This includes such counters as total number of packets sent and received, number of bad packets received, time-outs, etc.

-r—Show the routing table. Using this option is equivalent to the *route* command. Refer to *route* in **Section 4.12**, for a description of routing information and format.

-m—Show the memory statistics recorded for the network buffer pool. These statistics include amount of free memory, number of failed memory allocations, number of memory errors, and the network mbuf usage statistics.

4.10 ping

Send an ICMP packet to see if a remote host is alive

Syntax

ping *dest_addr*
ping *dest_addr* [*packet_size*]
ping -s *dest_addr* [*packet_size*] [*count*]

Description

The *ping* command uses the ICMP protocol's mandatory ECHO_REQUEST packet to solicit an ICMP ECHO_RESPONSE from the specified destination address. ECHO_REQUEST packets (pings) consist of an IP and ICMP header, time stamp space, and an arbitrary number of bytes to pad out the packet. If the *dest_addr* responds, *ping* displays a round-trip time in milliseconds for the exchange and exits. If there is no response, *ping* displays the message *Target did not respond.*

Subcommands and protocols

ping *dest_addr*

dest_addr—Enter the IP address of the device where packets will be sent. Use standard dotted-quad notation or the host name if DNS service is available.

ping *dest_addr* [*packet_size*]

dest_addr—Enter the IP address of the device where packets will be sent. Use standard dotted-quad notation or the host name if DNS service is available.

packet_size—Modify the default packet size *ping* sends, which is 4 octets.

ping -s *dest_addr* [*packet_size*] [*count*]

dest_addr—Enter the IP address of the device where packets will be sent. Use standard dotted-quad notation or the host name if DNS service is available.

packet_size—Modify the default packet size *ping* sends, which is 4 octets

count—Enter a count of the number of packets generated. With *-s* set, *ping* sends one packet per second by default, and prints one line of output with round trip time for every ECHO_RESPONSE received.

4.11 rip

Configure/display Routing Information Protocol information

Syntax

rip accept *router_addr*
rip add *host_addr seconds* [*flags*]
rip delete *host_addr*
rip duplicate [{**on** | **off**}]
rip merge [{**on** | **off**]]
rip netmask add *net_addr /net_bits /subnet_bits*
rip netmask delete *net_addr/net_bits*
rip netmask list
rip refuse *router_addr*
rip request *router_addr*
rip status

Description

The *rip* command is used to display information about or configure the Routing Information Protocol (RIP). The RIP protocol is used to automatically transfer routing table information between routers. The table information is sent at specified intervals and also sent whenever a previously reachable destination becomes unreachable.

Subcommands and parameters

rip accept *router_addr*

Remove the router with address *router_addr* from the RIP filter table, allowing future RIP packets to be accepted from that router. This is the opposite of the *rip refuse* subcommand.

router_addr—Enter the address of the router to be removed from the RIP filter table, allowing future packets to be accepted from it.

rip add *host_addr seconds* [*flags*]

Adds an entry to the RIP table. The host with address *host_addr* is sent the entire IP routing table every *seconds* seconds.

host_addr—Enter the address of the host to add to the RIP table.

seconds—Enter the number of seconds of the intervals when the RIP table is updated with this address.

flags—If set to **1**, then split horizon processing is performed for the destination. That is, any IP routing table entries pointing to the interface to be used to send this update will be removed from the update. If split horizon processing is not specified, then all routing table entries except those marked private will be sent at each update.

rip delete *host_addr*

Remove an entry from the RIP table for the host with address *host_addr*. This is the opposite of the *rip add* subcommand.

host_addr—Enter the address of the host to delete from the RIP table.

rip duplicate [{**on** | **off**}]

Allow multiple routes to the same destination to co-exist in the IP routing table.

off—Only one route will be retained for any remote destination. This is the normal IP RIP behavior, and the default in the Router.

on—Multiple routes to the same destination may be retained in the IP routing table. This is required for automatic fallback (from a leased sync line to a dialup async modem connection), and will be automatically set up when such a configuration is created with the config command. The *rip duplicate on* command also automatically sets *rip merge off*.

rip merge [{**on** | **off**}]

Enable or disable merging of RIP table entries.

on—Enable merging RIP table entries. When enabled, the table is scanned after processing each RIP update packet. If an entry is redundant, it is deleted from the table. An entry is considered redundant if the target(s) it pertains to is routed identically by a less specific entry already in the table. The target address(es) specified by the entry in question must also match the target addresses of the less specific entry, and the two entries must have the same interface and router fields.

off—Disable merging RIP table entries.

rip netmask add *net_addr /net_bits /subnet_bits*

Inform RIP of the netmask to be applied to addresses in incoming routing information packets, to create the correct routing table entries for networks that do not have 16 bit or 24 bit netmasks. For instance, the command

```
rip netmask add 128.66.0.0/16/20
```

informs RIP that within the class B network 128.66.0.0, 20-bit subnets are used (i.e. the netmask is 255.255.240.0). In order to describe an area with smaller subnets within this network, you could add the command

```
rip netmask add 128.66.192.0/20/24
```

If you create networks where different subnets use different masks, be aware that different RIP implementations may not be compatible with your network after this is done.

rip netmask delete *net_addr/net_bits*

Delete netmasks from the list.

net_addr—The network address of the network with the netmasks to be deleted.

net_bits—The bits that comprise the netmask.

rip netmask list

Display a list of the netmasks.

rip refuse *router_addr*

Cause the Router to refuse RIP packets from the router with address *router_addr*. This is the opposite of the *accept* subcommand.

router_addr—The address of the router from which packets must be refused.

rip request *router_addr*

Cause the Router to send a RIP Request packet to the router with address *router_addr*, causing it to reply with a RIP Response packet containing its routing table.

router_addr—The address of the router to send a RIP Request packet.

rip status

Display the current RIP statistics such as the number of RIP packets sent/received, etc.

4.12 route

Configure/display the IP routing table

Syntax

route
route add *dest_addr[/bits] iface router_addr* [*metric*]
route addprivate *dest_addr*[*/bits*] *iface router_addr* [*metric*]
route add default *iface router_addr* [*metric*]
route delete *dest_addr*[*/bits*] [*iface*]
route [-f]
route lookup *dest_addr*

Description

Use the *route* command to manually manipulate and display the IP routing table.

Subcommands and parameters

route

Use *route* without arguments to display all the routes currently in the routing tables. The header display format is:

Destination Bits Interface Router/Next Hop Metric Timer Use Flags

- *Destination*—the destination address *dest_addr*.

- *Bits*—subnet mask */bits*.
- *Interface*—interface *iface* on which matching packets are routed.
- *Route/NextHop*—IP address of the next hop.
- *Metric*—the number of hops to the destination.
- *Timer*—seconds left until the route expires. A value of 0 indicates a permanent route.
- *Use*—the number of times this route has been used.
- *Flags*—provide information about the route. Possible values for this field are:

  `T`—temporary route that will be deleted when timer value reaches zero. The timer is set at 240 seconds by RIP.

  `P`—private route that RIP will not advertise.

  `U`—trigger route, recently changed but not yet advertised by RIP.

  `D`—the interface associated with this route is currently down.

route add *dest_addr*[*/bits*] *iface router_addr* [*metric*]

Adds a route to the network indicated by the destination network you specify with:

dest_addr—The address of the network towards which you are defining a route.

/bits—The number of significant contiguous bits in the destination address *dest_addr* to be used as a subnet mask for matching. If the number of subnet mask bits is not specified, 32 bits are assumed as a default.

iface—**eth0, modem0-4, sync0**

router_addr—The address of the closest router to your Router where packets should be sent first, called the next hop.

metric—The number of hops to the destination.

route addprivate *dest_addr*[*/bits*] *iface router_addr* [*metric*]

Add a private route to dest_addr, which will not be advertised by RIP.

dest_addr—The address of the network towards which you are defining a route.

/bits—The number of significant contiguous bits in the address *dest_addr* to be used as a subnet mask for matching. If the number of subnet mask bits is not specified, 32 bits are assumed as a default.

router_addr—The address of the closest router to your Router where packets should be sent first, called the next hop.

metric—The number of hops to the destination.

route add default *iface router_addr* [*metric*]

Specifies the next hop router to which packets with no corresponding entry in the routing table will be sent.

iface—The desired default interface.

router_addr—The address of the closest router to your Router where packets should be sent first, called the next hop.

metric—The number of hops to the destination.

route delete *dest_addr*[*/bits*] [*iface*]

Deletes a route to *dest_addr*.

dest_addr—The address of the network towards which you are defining a route.

/bits—The number of significant contiguous bits in the address *dest_addr* to be used as a subnet mask for matching. If the number of subnet mask bits is not specified, 32 bits are assumed as a default.

route [-f]

Flushes the dynamically-learned RIP entries from the routing tables.

route lookup *dest_addr*

Displays the route in the route table for that address (*dest_addr*).

4.13 snmp

Configure/display Simple Network Management Protocol (SNMP) information

Syntax

snmp set community *community_name* [**-p** {**ro** | **rw**}] [**-t** {**on** | **off**}]
snmp delete community *community_name*
snmp set acl *community_name host_addr* [*host_addr...*]
snmp delete acl *community_name host_addr* [*host_addr...*]
snmp set authtrap {**on** | **off**}
snmp set contact *contact_string*
snmp set location *location_string*
snmp status [**-c** [*community_name*]]

Description

The *snmp* command is used to configure and to display information about the Simple Network Management Protocol (SNMP) agent.

NOTE

The Router's SNMP agent contains support for the Novell IPX MIB, but it does not support SNMP over IPX. Your SNMP management application must be run over IP.

Subcommands

snmp set community *community_name* [**-p {ro | rw**}] [**-t {on | off**}]

Add a community by specifying its *community_name*.

-p—access privilege for the community. If the **-p** option is not specified, the default is **ro** (read-only). Read and write access is granted using **rw**.

-t on—specifies that the Router send SNMP Trap PDUs to hosts in the Access Control List (ACL) of the community. If the **-t** option is not specified, the default is **off**, and SNMP Traps are not generated

to IP hosts in the community ACL.

snmp delete community *community_name*

Delete the community from the access control database. When a community is removed, its *community_name* is invalidated as well as its access control list and access privileges.

community_name Enter the name of the community.

snmp set acl *community_name host_addr* [*host_addr...*]

Use this subcommand to add IP addresses to the community ACL. The community must exist before issuing this command. Before host names have been added to the empty ACL any host is allowed access to Router SNMP MIB objects. Once a host is assigned to an ACL, only that host may gain access. IP addresses are specified in dotted-quad notation, or by name if a Domain Name Service is in use.

snmp delete acl *community_name host_addr* [*host_addr...*]

Remove host(s) from the Access Control List of a community.

community_name host_addr Enter the address(es) of the host to remove.

host_addr Enter additional addresses if necessary.

snmp set authtrap {**on** | **off**}

Enable and disable transmission of SNMP *authenticationFailure* traps.

on—Enables transmission. When enabled, if an incoming SNMP PDU has insufficient access control privileges based on community name and source address, then *authenticationFailure* traps are sent to all IP addresses in the ACLs of communities configured to receive traps.

off—Disables transmission.

snmp set contact *contact_string*

Set the name of the person responsible for the node.

contact_string. Enter the name. The default is “Technical Support.”

snmp set location *location_string*

Set the system location.

location_string. The default location is “Computer Room.”

snmp status [**-c** [*community_name*]]

Use this subcommand to display the current status of SNMP. The default display with no command-line parameters includes:

- indication that SNMP is enabled or disabled
- indication that SNMP Authentication Trap transmission is enabled or disabled
- SNMP system variables including sysDescr, sysLocation, sysContact, sysName, and sysUptime

-c—parameter is used to display the contents of the access control database. The community data for all communities is displayed unless the *community_name* is specified on the command line. In this case, the information for the specified community is displayed.

4.14 syslog

Configure/display system logging information

Syntax

syslog {**on** | **off**}
syslog address *host_addr*
syslog class *class_value*
syslog message *message_string*
syslog priority *priority_value*
syslog status

Description

The *syslog* command sets the configuration of how significant events are recorded to a log that displays on the system console. The following events cause syslog messages to be generated:

- a remote site dials up
- a remote site dials in
- a critical error occurs
- the router reboots
- informational/debug messages are generated

Once you enter *syslog on*, the messages are displayed on the Router's system console, even when the administrator is not logged onto the console. System log messages with priority *LOG_WARNING* or higher (4 through 0) are always sent to the console.

If a host is specified with the address subcommand, messages are also sent to the host with the address *host_addr*.

NOTE

The Router uses syslog to log significant events due to IPX and IP traffic. Sent over an IP network, messages related to significant IPX events are always displayed at the console, because the Router may be operating in an IPX-only environment, in which a syslog host does not exist.

Subcommands

syslog {**on** | **off**}

on—Disables the local display of system log information. and moves the display to the command terminal from which it was entered. For example, if the Router is currently displaying syslog messages on the serial console, entering **syslog on** from a telnet session moves the syslog messages to the telnet session.

off—disables local display of the system log information. The **syslog on** subcommand moves the display to the command terminal from which it was entered. For example, if the Router is currently displaying syslog messages on the serial console, entering **syslog on** from a telnet session will move the syslog messages to the telnet session.

syslog address *host_addr*

With no parameters specified this command displays the IP address of the syslog daemon.

host_addr—Enter the address of the host which will receive all syslog messages from the router.

syslog class *class_value*

Set the class of syslog message to be sent.

class_value—Enter a decimal number from **0** to **31**. The default value is **16** (class *local0*). When editing */etc/syslog.conf* on your UNIX system to enable recording or display of the log, use the following message class names:

- 16 - local0
- 17 - local1
- 18 - local2
- 19 - local3
- 20 - local4
- 21 - local5
- 22 - local6
- 23 - local7

syslog message *message_string*

Record a system log message. This is useful for marking events manually or for testing.

message_string—Enter the message you want to record.

syslog priority *priority_value*

Set the priority of syslog message to send.

priority_value—Enter a number from **0-7**. The default is **7**, indicating that all messages be sent. When editing */etc/syslog.conf*, use the following priority names:

- 7 - debug
- 6 - info
- 5 - notice
- 4 - warning
- 3 - err
- 2 - crit
- 1 - alert
- 0 - emerg

The priority value indicated is:

- used to filter the local display of syslog messages. All syslog messages are sent to the logging host, which may do its own filtering.
- used as the priority for the "syslog message" command.

syslog status

Display the current system log configuration.

4.15 tcp

Configure/display the Transmission Control Protocol information

Syntax

tcp irtt [*milliseconds*]
tcp mss [*size*]
tcp reset *tcb_addr*
tcp rtt *tcb_addr rtt*
tcp status [*tcb_addr*]
tcp window [*size*]

Description

The *tcp* command configures and displays information regarding the Transmission Control Protocol (TCP). TCP is only used in FTP and telnet servers resident in the Router.

Subcommands and parameters

tcp irtt [*milliseconds*]

Set the initial round-trip time estimate to milliseconds for new TCP connections. Once the TCP connection is open, it measures and adapts to the actual round trip time. With no parameters, this subcommand displays the current initial round-trip time and the round-trip times of past connections.

milliseconds—Enter the estimated number of milliseconds. The default is 5000 milliseconds.

tcp mss [*size*]

Set the maximum segment size for new TCP connections. With no parameters, this subcommand displays the current maximum segment size.

size—Enter the maximum segment size in packets.

tcp reset *tcb_addr*

Reset and deletes a TCP connection specified by the TCB address. Display TCB addresses with the *tcp status* subcommand.

tcb_addr—Enter the TCB address of the TCP connection you want to delete.

tcp rtt *tcb_addr rtt*

Replace the automatically computed round-trip time **rtt** parameter value in the TCP connection specified by *tcb_addr*.

tcb_addr—Enter the TCB address of the TCP connection for which you wish to redefine the round trip time.

rtt—Enter the new round trip time. The value is expressed in milliseconds.

tcp status [*tcb_addr*]

Display TCP-level information for TCP connections. Without arguments, all TCP connections are displayed with their TCB addresses.

tcb_addr—Enter the TCB address of a specific TCP connection to display a detailed report of its TCP status.

tcp window [*size*]

Display or set the default receive window size for new TCP connections. With no argument, the current receive window size is displayed.

size.—Set a default receive window size. This value is expressed in octets.

4.16 traceroute

Trace the route to a host

Syntax

traceroute [**-w** *wait*] [**-m** *max_ttl*] [**-q** *nqueries*] *host_addr*

Description

This command displays the route that a packet takes to reach a specified host at address *host_addr*. The trace starts at the router and uses a series of UDP probe packets with increasing IP Time-To-Live (TTL) fields to determine the sequence of routers that must be traversed in order to reach the host.

Subcommands and parameters

-w—Set the maximum interval in seconds that traceroute waits for a response at each stage of the trace.

wait—The wait value in seconds. The default is 5 seconds.

-m—Set the maximum IP time-to-live (TTL) value that traceroute uses at each stage of the trace.

max_ttl.—The TTL value in seconds. The default is 30 seconds.

-q—Set the number of UDP probes to send at each stage of the trace.

nqueries—The default is 3 queries.

host_addr—The IP address of the host packets are attempting to reach. Use dotted-quad notation or the host name where DNS is available.

Example

```
traceroute to today.earth.cmc.com(222.99.32.116), 30 hops max, 38 byte packets
 1  Arrow.Today.CMC.COM (222.99.12.208)  800 ms  640 ms  760 ms
 2  Target.Today.CMC.COM (222.99.12.116)  640 ms  620 ms  640 ms
 traceroute done:normal (Unreachable Port)
```

4.17 udp

Display the User Datagram Protocol information

Syntax

udp status

Description

Displays information about the User Datagram Protocol (UDP), such as the UDP statistics and the status of all UDP receive queues.

Appendix A: System Messages

This appendix contains an alphabetical listing of error and information messages that can appear on your Router's serial port console. There are two types of messages: syslog and console. Syslog messages are generated by the UNIX-style logging system syslog; console messages are generated by the system and are only generated when there is a console or telnet session active. If your network does not support IP, syslog messages (sent from the Router) cannot be logged on remote hosts. The messages can be displayed on the console by using the syslog on command.

NOTE

Important! Because the values of the variables will depend upon your specific network configuration, host names, parameters selected, etc., all variables contained in message strings will be shown in italics. Many of the variables also have under_scores in them.

Syslog messages by group:

- CHAP
- Dialer
- Filter
- Multilink
- IPX
- PAP
- RIP
- SCHAP
- SNMP
- System

Console messages by group:

- ARP
- DIALER
- Filter
- IFCONFIG
- IPFILTER
- IPROUTE
- IPX
- PING
- PPP

- RIP
- SNMP
- SYSTEM
- TCP
- TIP
- TRACE
- TRACEROUTE

A.1 Syslog Messages

This section contains a listing of error messages that the Router collects for the UNIX system logging system (*syslog*).

syslog can be configured to send messages to a specified remote IP host (where they are displayed or logged remotely, according to how the remote syslog daemon is configured), or to the Router's serial port console (after the syslog on command has been entered at the console).

The system messages are listed in alphabetical order within defined categories (groups), as they are displayed on the screen. The groups identify the source module from which the error message originated. The priority entries (assigned by *syslog*) indicate which log in *syslog* that the message is stored in. Also refer to the *syslog* command.

A.1.1 CHAP GROUP

iface `CHAP failed to verify` *user_name*

The system at the other end of the PPP link presented an invalid username; the Router will disconnect the line. Reconfigure CHAP with the correct user and password information. Priority: LOG_ERR

iface `CHAP Unexpected remote challenge`

The remote system has requested CHAP password validation, but this end does not have a userid or password configured. Use the *config modify* command to add the CHAP user name. Reboot the local Router to effect the configuration. When this error occurs, link validation is declared failed and the link is disconnected. Priority LOG_ERR.

iface `CHAP peer says`: *salutation_string*

The information string returned by a peer CHAP authenticator. This string could say *Welcome* on a successful connection, or *Invalid response* on an unsuccessful connection attempt. This message can help you determine if the link was established successfully. Priority: LOG_INFO.

A.1.2 DIALER GROUP

`Account disabled at this time`

The client (who is logged in) is being disconnected because their access shift has just expired. Priority: LOG_WARNING.

iface `call failed`: *reason*

The Router has attempted to place a call and failed to connect. Any of the following reasons for failure may be displayed: NO CARRIER, BUSY, NO DIALTONE, NO ANSWER. Priority: LOG_ERR.

iface `canned dialer failed:` *reason*

The Router failed to establish a modem link at the destination, using the factory-configured (canned) dialup commands; the reason for failure is displayed: NO CARRIER, BUSY, NO DIALTONE, NO ANSWER. Priority: LOG_ERR.

iface `can't dial: exceeded today's quota of xxx minutes`

The *dialup* command includes an option to set time quotas to limit the expense during set time periods, for the cost of long distance telephone lines. Wait until the next day to establish a modem connection (when the daily quota is reinstated), or explore the option with your network administrator for extending the quota limit. Priority: LOG_ERR.

iface `can't dial: DCD is high`

An attempt to dial out found Data Carrier Detect (DCD) signal already on. DCD must be off to dial out. Check the telephone line to determine if the remote end is off hook. Check the modem initialization string with the *config show* command to verify that the **&C1** command is included, and use the dialup status command to monitor the status of DCD. Priority: LOG_ERR.

iface `can't read dialer script file_name.`

The Router was unable to find the specified dialer script, *file_name*. Be sure the *file_name* specified in the dialup command is not misspelled, and verify that the file is on the boot disk. Priority: LOG_ERR.

iface `current speed(bps):` *num*

A syntax error was detected while attempting to set the modem speed. This error will cause any dialer script to terminate prematurely and leave the modem speed unchanged. Correct the syntax error in your dialup script file and run the script again. Priority: LOG_ERR.

iface `dialer script failed` *failure_message*

The dialer script has failed. Since the script file was most likely validated during its setup, check to see if any of the destination parameters have changed. Continue debugging the dialer script until it is again validated for use. Priority: LOG_ERR.

iface `Dialing for` *destination_addr*

An informational message that appears when dialing is initiated for a remote connection. This message can help you determine what type of traffic is causing the Router to dial. Priority: LOG_DEBUG.

iface `dialup link appears to be up`

The Router has dialed a phone number and has established a connection over the interface. Priority: LOG_INFO.

iface `dropping link, exceeded today's quota of` *num* `minutes`

The *dialup* command includes an option to set daily time quotas, to limit the expense for the cost of long distance telephone lines. Wait until the next day to establish a modem connection, or explore the option with your network administrator for extending the daily quota limit. Priority: LOG_WARNING.

iface `hanging up, status returned:` *modem_result_code*

An abnormal condition has caused the modem to hang up. The modem result code is displayed at the end of the message. Priority: LOG_ERR.

iface `hangup failed`

The Router attempted to hang up the phone but the modem did not respond as expected. As a result, the Router will attempt to re-initialize the modem. Wait to see if re-initialization is successful before taking any action. If not successful, reboot the Router. Priority: LOG_ERR.

iface `hangup re-initialization failed`

The Router has unsuccessfully attempted to re-initialize the interface. Try cycling power off then on again, to reboot the Router. This could be a modem failure. Priority: LOG_ERR

iface `hangup took: xxx milliseconds`

If the modem hangup took an unusually long time, this message is displayed along with the hangup time. Priority: LOG_NOTICE.

iface `high usage, exceeded today's quota of` *num* `minutes`

You can set a quota limit for the amount of telephone online time allowed each day. (See *Appendix B* in the *User's Guide* at the front of this manual.) This message means that line use has exceeded the established daily limit. You can wait until the next day when the daily quota is reinstated to make calls, or request an increase in the daily quota from your network administrator. Priority: LOG_WARNING.

iface `incoming call`

The Router has sensed an incoming call and has answered the phone. Priority: LOG_NOTICE

iface `is busy`

The modem was already busy when an attempt was made to dial up a connection. Investigate and correct the cause of the modem being already busy; then retry. If necessary, cycle the Router power off then on again. Priority: LOG_ERR.

iface `line speed:` *modem_line_speed*

Reports the actual line speed that the two modems have negotiated between themselves. The modem line speed is different than the serial port speed, as set by the *ifconfig modemX speed* command. Certain uncontrollable telephone conditions can cause the *modem_line_speed* to be lower than expected, and may also cause the *modem line speed* message to be absent. The *modem line speed* message will reappear with normal telephone line conditions. Priority: LOG_INFO.

iface `link idle, hanging up`

No data has been transmitted over the modem link for the specified idle timeout and the Router is dropping the telephone line, as the normal response. Priority: LOG_INFO.

iface `link lost, going idle`

The Router has sensed a lost carrier signal for reasons unrelated to the local modem. This usually

means that the period of network inactivity has exceeded the idle timer setting in the *dialup* command. Priority: LOG_INFO.

iface `link stalled, hanging up`

A modem link in keepup mode is idle and an attempted connection did not get a response. Try again later. If problem persists, recycle the power. Priority: LOG_INFO.

iface `misconfigured speed,` *actual_speed* `speed_tried`

An attempt was made to set the serial port to an illegal speed. Correct the error in the *dialup* command line and reissue the *dialup* command to the modem. Priority: LOG_ERR.

iface `not initialized, dialer exiting`

The modem was not initialized. If using a dialer script, verify that the initialization string is correct and the command line is in the correct order. Otherwise, cycle the Router power off then on again to try another modem initialization. If the modem still does not initialize, contact Technical Support. Priority: LOG_ERR.

iface `not ready`

The Router has not received the DTR signal and the modem is not functional for unknown reasons. Cycle the power off and on again. If the problem persists, call Technical Support for assistance. Priority LOG_WARNING.

iface `outdial not allowed`

An attempt has been made to dial out from the Router while the interface has been configured for incoming calls only. Priority: LOG_ERR.

iface `redial failed m_response This should say OK`

An attempt to redial and establish a modem connection failed with an unexpected modem response message. The response that is displayed should have been the normal modem OK response. This error will stop the Router from completing its current function, whether it is dialing from a script, or just re-initializing the modem. Look for a dialer script error, then cycle the Router power from off to on to restart the Router. Priority: LOG_ERR.

iface `time connected:` *time* `Pkts sent:` *num* `Bytes sent:` *num* `Pkts recvd:` *num* `Bytes rcvd:` *num*

Normal usage statistics that are displayed at the end of every session. Priority: LOG_INFO.

iface `tip or dialer already active`

The interface is currently being used by tip or another dialer. Wait until the interface is not busy or correct the busy condition. Priority: LOG_ERR.

iface `total connections:` *xxx* `in:` *xxx* `out:` *xxx*

At midnight each day the Router prints a connection report containing status information for total connections, connections in, and connections out. Priority: LOG_INFO.

iface `V.25bis call failed -` *reason_returned*

A dialup connection using the V.25 bis protocol failed. The reason for failure is displayed with this

message. This message will almost never be seen because the Router will fall back to V.25 bis only if limited capabilities of the remote modem force it.

iface `V.25bis call timed out`

This is a routine notification that a dialup connection (using the V.25 bis protocol) timed out from inactivity. This message will almost never be seen as the Router will fall back to V.25 bis only if limited capabilities of the remote modem force it.

modemx `timeout was set to 86400 seconds (24 hours), the maximum setting`

An attempt was made with the dialup command to set the timeout value higher than permitted. In that event, the system automatically sets timeout at the maximum allowed setting, and displays the above message.

`Updating` *modemx* `(init)`

This message is sent after the IPX update command has been issued with the init parameter. This updates (synchronizes) the local and remote networks. Priority: LOG_DEBUG.

`Updating` *modemx* `(now)`

This message is sent after the IPX *update* command has been issued with the *now* parameter. This updates (synchronizes) the local and remote networks' IPX service and routing information. Priority: LOG_DEBUG.

`Updating` *modemx* `(periodic)`

This message is sent after the IPX *update* command has been issued with the *periodic* parameter. This updates (synchronizes) the local and remote networks' IPX service and routing information. Priority: LOG_DEBUG.

A.1.3 FILTER GROUP

`possible security violation:` *iface* `received` *proto addr:port -> addr:port*

This message indicates that a packet was received on a different interface from that which we would have used to send data to the originator (of the packet). This message will be displayed every 5 seconds or so. One of the following conditions exists:

- your site is being attacked with forged packets pretending to come from inside your network
- your network's routing plan is misconfigured

If your network includes redundant routing such as dial backup for leased synchronous lines, this message may merely reflect a temporary routing anomaly. In such network configurations, you may have to allow the packets to flow through, in order for the RIP protocol to establish the new routing pattern when the call fallback occurs. Also see the "[ip] filter spoof" command.

A.1.4 IPX GROUP

iface `Dialing for`: *source_ipxaddr:socket dest_ipxaddr:socket*

This is a routine notification that an IPX dialup connection is being initiated, with the source and destination IPX addresses identified.

iface `Answered call for`: *source_ipxaddr:socket dest_ipxaddr:socket*

This is a routine notification that an IPX dialup connection was answered, with the source and destination IPX addresses identified.

A.1.5 PAP GROUP

`Callback not allowed`

A non-Async-Client has attempted to call into the Router. However, the Router has been configured for security callback. Security callback only works with Async Client clients. Priority: LOG_ERR.

iface `failed to authenticate` *error_string*.

The Router (at the other end of the PAP connection) is configured with an invalid user name. Correct the remote user name and be sure the remote link password is also configured correctly. Priority: LOG_ERR.

iface `PAP peer says`: *message*

The system at the other end of the PAP link has reported the connection message. The message can be `Welcome`, in which case authentication is valid and the connection is good; or `Invalid` *username* or *password*. If you must make username or password corrections in order to complete a connection. Priority: LOG_INFO.

`Invalid Authentication method`

This error message indicates that a LAN-to-LAN dial-in connection has attempted to use PAP authentication when the line has been configured for another form of authentication. Priority: LOG_ERR.

`Not allowed in at this time`

A client has attempted to log in during a non-shift time, or the client account is disabled. Priority: LOG_ERR.

A.1.6 RIP GROUP

`RIP: received own update`

Indicates that a network neighbor is misconfigured, so that it is returning the Router's RIP updates back onto the same network. No harm is done to the Router, but the errant remote RIP host should be correctly configured. Priority: LOG_ERR.

A.1.7 SECURITY CALLBACK GROUP (SCHAP)

`Not allowed in at this time`

A client has attempted to log in during a non-shift time, or the client account is disabled. Priority: LOG_ERR.

`Failed to verify user_name`

The user name presented by the client is not in the client account database. Priority: LOG_ERR.

A.1.8 SNMP GROUP

`SNMP Trap addr unreachable trap type` *type_no*

An attempt was made to send an SNMP trap with type *type_no* to an IP destination that is unreachable. Reconfigure the SNMP access control group to specify a reachable IP address. Priority: LOG_ERR.

A.1.9 SYSTEM GROUP

`Restart complete` *version_string*

Informational message that is displayed at the completion of a startup or reboot. Priority: LOG_NOTICE.

`SYSTEM: too many entries in the passwd file (max = 10)`

The Router has detected the maximum entries in the passwd file. The current maximum is 10. Delete any unused password entries, to add another. Priority: LOG_WARNING.

A.2 Console Messages

This section contains a listing of error and information messages, that are displayed either on the serial port console attached to the Router, or on a remote console (in use during a Telnet session with the Router).

If no local or remote console is in use, these messages will not appear.

Certain messages are prefixed with a capitalized name and a colon. This prefix is the name of the Router software module that originated the message. When calling Technical Support about a message, mention this module's name. The prefix names are listed in alphabetical order with their associated messages.

A.2.1 ARP GROUP

`ARP:` *iface* `Attach device first`

While processing an *arp* command, the Router has determined that the Ethernet interface is not working, or is not configured. Run the *ifconfig* command to determine the state of the Ethernet interface. Re-issue the *ifconfig* command to mark the interface up, if necessary.

`ARP: Unknown host:` *host_name*

An attempt to enter a host name failed because the Router was unable to resolve the *host_name* to an IP address. Check for typos on your command line.

A.2.2 DIALER GROUP

`DIALER: dialup once:` *iface* `already connected`

A *dialup once* command was executed to dial on the modem. However, the dialer detected that the modem was already connected. Use *dialup reset* to send a hangup command to the modem; then try again.

`DIALER: dialup once:` *iface* `is busy`

The *dialup once* command can be used to verify a dialer script file or to verify a valid telephone line. This message normally means that the phone on the other end is busy. Try again later or investigate the reason for a busy phone. Use the *dialup reset* command if the modem at the other end of the phone line

is not busy. Try restarting the Router, if *dialup reset* doesn't work.

`DIALER: dialup once:` *iface* `not available`

A *dialup once* command line was issued when the dialer is not in a state from which it can dial out. Issue the *dialup reset* command or reboot the Router to correct the irregular modem state and reissue the dialer command line.

`DIALER:` *iface* `invalid speed` *num*

A modem initialization string from either the dialup command or a script file was given that included an invalid modem speed. Only modem speeds divisible by 2400 are valid. Re-enter the command.

`DIALER: Illegal interface:` *iface*

The interface specified in the *dialup* command is not a valid modem interface.

`DIALER:` *modemx* `cannot be dialed`

An undefined error condition is preventing the dialer from functioning correctly on *modemx*. Restart the Router and try again. If the problem continues, contact Technical Support.

`DIALER:` *modemx* `no dialer`

An undefined problem has caused the dialer to terminate. Try restarting the Router to re-initialize the modem. If the problem continues, contact Technical Support.

`DIALER: invalid telephone number:` *num_entered*

The program has determined that the telephone number you enter or included in a script file is invalid. Correct the number.

`DIALER: Cant read dialer script file,` *file_name*

The dialer script file shown could not be found. Verify that dialer script file is present on the boot disk and check for typos in the command file. (Dialer script files have the *.dcf* extension.) Then retry the command line.

`DIALER: Unknown interface:` *iface*

The interface specified in the *dialup* or *dialup status* command could not be found. Check your command line for typos or enter another interface. Re-enter the *dialup* command line with the correct modem interface.

A.2.3 Filter Group

`Filters cannot be added to slave interface` *iface*

This response to a **filter add** command indicates that the named *iface* argument is component of a multilink group. You can only apply filters to the multilink interface, and not to the individual interfaces in that group.

A.2.4 IFCONFIG GROUP

`IFCONFIG: Must first set the IP address for iface:` *iface_name*

In order to mark your interface up, the *ifconfig* command requires that you first set the IP address. Set the IP address and then you will be able to mark the interface up.

`IFCONFIG: WARNING: No Ethernet cable attached`

The Router has detected that no Ethernet cable is attached. Connect your Ethernet cable and power down the Router, to ensure that upon startup, it senses the Ethernet cable.

`IFCONFIG:` *iface* `not allowed to be marked down`

The console and loopback interfaces cannot be placed in the down state. This is the normal message that appears, if the *ifconfig* command is used in the attempt to mark either of these interfaces as down.

`IFCONFIG:` *iface* `unknown encapsulation mode`

An incorrect encapsulation mode was entered on your command line. Check for typos on the command line. Re-enter your command line with the correct encapsulation mode.

`IFCONFIG:` *iface* `unknown interface`

The Router was unable to locate the specified interface. Check for typos on the command line. Re-enter your command line with the correct interface.

A.2.5 IPFILTER GROUP

`IPFILTER:` *ip_addr* `bad address format`

The Router was unable to resolve the address given in a *filter add* command. Check your command line for typos or bad addresses; re-enter the command line with a valid address. The correct dotted-quad address notation is: `nnn.nnn.nnn.nnn`

`IPFILTER: Unsupported interface:` *iface*

The *filter add* command did not recognize the specified interface. Check for typos on the command line. Supported interface names can be displayed by entering the *ifconfig* command.

A.2.6 IPROUTE GROUP

`IPROUTE: no default route`

A *route delete* command attempted to delete the default route, when a default route did not exist.

`IPROUTE: No route to` *host_name*

A *route delete* command has been issued and the Router was unable to delete the route because: (a) no such route had been created, or (b) the host_name is unknown. Check your command line for typos and re-enter.

`IPROUTE: Unknown interface:` *iface*

An attempt to add a route failed because the Router was unable locate the specified interface. Check for typos on your command line. Enter the *ifconfig* command to display the currently available interface names.

`IPROUTE: Bad` *host_name*

The Router was unable to find a route to the specified *host_name* or *IP_addr*. Verify that the destination host is up and networking, and connected to the expected network. Use the **ping** command to help isolate the problem.

A.2.7 IPX GROUP

`IPX: Cannot change network address while` *iface* `is up`

You must first mark the interface down before changing its network address.

`IPX: Interface` *modemx* `already has network address:` *num_addr*

The same network number cannot be assigned to more than one interface. Choose a different network number and re-enter your command.

`IPX: Invalid network number:` *net_number* `Network number must be a hexadecimal number`

An incorrect network number was entered. Check your command-line entry for typos, and re-enter the correct network number.

`IPX: IPXWAN is not supported over the specified interface`

The Router supports IPXWAN only over its modem interface.

`IPX: Invalid frame type for iface:` *iface_name*

An incorrect frame type was entered for the interface selected. Re-enter your command line with the correct Ethernet frame type.

`IPX:` *iface_name* `is not a routable interface`

The interface selected on your command line is not routable.

`IPX: No route to` *network*

The network selected on your command line has no route from the Router.

`IPX: Interface must be a dialup interface`

The interface type that you have selected requires a dialup interface. Re-enter your command with the correct interface type.

`IPX: Must first set the IPX network address for iface` *iface_name*

An attempt was made to mark an interface up before a network address was assigned to it. Use the *ifconfig* command to assign the network address; then you can mark the interface up.

`IPX: Unknown interface:` *iface*

An invalid interface name was entered. Check for spelling of the interface name on the command line. You can display currently valid interface names by entering the *ifconfig* command. Re-enter the command line.

`IPX: Unsupported interface:` *iface*

An unsupported interface name was entered. Check for the correct interface. You can display currently valid interface names by entering the *ifconfig* command. Re-enter the command line.

A.2.8 PING GROUP

`PING: Invalid packet size`

You have entered a *ping* command with the packet-size parameter specified to be larger than 512K. The maximum Router ping packet size is 512K. Try the command again with a smaller packet size parameter.

`PING: No known DNS servers`

No domain name server is present in the current Router configuration, or no domain servers are present. If you are using Domain Name Service, use the *config modify* command to add one or more domain name servers to your configuration.

`PING: Resolving` *host_name...*

This message is displayed initially after entering your TCP/IP command, while the resolver is attempting to map *host_name* to an IP address. If the mapping is unsuccessful, the message is displayed.

`PING: Unknown host:` *host_name*

An attempt to ping *host_name* failed because the Router was an unable to resolve the given *host_name* to an IP address. Check routing to the name server and verify that Name Service is running. Try entering the IP address of the destination host rather than the *host_name*.

A.2.9 PPP GROUP

`PPP: Unknown interface:` *iface*

The interface specified in the *ppp* command could not be found. Check for typos on the command line, and re-enter the command line.

`PPP:` *iface* `not a ppp interface`

A *ppp* command was given with an incorrect interface. Enter the *ifconfig* command to display the available interfaces, and re-enter your command line.

A.2.10 RIP GROUP

`RIP:` *router_addr* `already in RIP filter table`

The *rip refuse* command has already been entered for *router_addr*.

`RIP:` *host_address* `not found in the RIP table`

The *rip delete* or *rip refuse* command was unable to find the specified *host_address* in its table.

`RIP:` *host_address* `unreachable`

The *rip add* command was unable to find a route to the given *host_address*.

A.2.11 SNMP GROUP

`SNMP:` *host_addr* `host address already in ACL`

An attempt was made to add a host to the ACL whose address was already in the ACL table.

`SNMP: Community:` *com_name* `not entered`

A *status* or *set* command was entered without a *com_name*. Re-enter the command line and include the *com_name*.

`SNMP: bad host address,` *host_addr*

The Router was unable to resolve the *host_addr* given in the *snmp set* command. Verify that *host_addr* is correct; the name server or host data base has *host_addr*; and re-enter the command line.

`SNMP: maximum host addresses exceeded, cant add:` *host_addr*

An attempt was made to add another host_addr when the maximum of eight addresses per community are already in the Access Control List (ACL). Delete an unused *host_addr*.

`SNMP:` *community_name* `not added, maximum community names exceeded`

An attempt was made to add another *community_name* when the maximum of eight community definitions are already in the Access Control List. Delete any unused communities to make room.

`SNMP:` *host_addr* `host address not in ACL`

An attempt to delete host_addr from the Access Control List (ACL) failed. Use the s*nmp status -c community_name* command to display contents of the ACL. Check for typos, verify that *host_addr* is valid, and re-enter the command line.

`SNMP: Access control list is empty`

A command line was issued that initiated display of community information and the Access Control List was found to be empty.

`SNMP: No communities configured`

A command line was issued that initiated display of SNMP communities, and it was found that no communities were configured.

A.2.12 SYSTEM GROUP

`SYSTEM: Make sure the floppy disk is write enabled`

Verify that the boot disk is write-enabled and fully inserted in the Router's disk drive. Re-enter the command line.

`SYSTEM: Mismatch - password unchanged`

During the process of changing the existing password and after the prompt to re-enter the new password, a mismatch was found between the two entries. Try again.

`SYSTEM: Please use at least one non-numeric character`

A valid Router password requires at least one non-numeric character. Try again.

`SYSTEM: Please use a longer passwd`

A valid Router password requires at least eight characters. Try again.

`SYSTEM: Cannot create config temp file:` *file_name*

The Router was unable to open and read *file_name*. Verify that a valid boot disk is inserted in the Router's disk drive and verify that *file_name* is on the boot disk. Re-enter the command line.

`SYSTEM: Unknown interface:` *iface_name*

An incorrect interface name was specified on your command line. Issue the **ifconfig** command to obtain a list of currently valid interfaces for your Router. Re-enter your command line.

`SYSTEM: Unknown parameter:` *parameter_name*

An incorrect parameter was specified on your command line. Re-enter your command line.

`SYSTEM: Unsupported parameter:` *parameter_name*

An unsupported parameter was specified on your command line. Re-enter your command line.

`SYSTEM: Insufficient arguments`

An insufficient number of arguments were specified on your command line. Re-enter your command line.

`SYSTEM: Unable to configure at this time, we are already being configured from another terminal.`

You should determine from where the Router is currently being configured. The possibilities include a forgotten *telnet* (IP only) session into the Router where a configuration process was started. If your investigation finds the other configuration action to be legitimate, allow it to complete; and then re-start your current action.

A.2.13 TCP Group

`TCP: Bad address format address`

The Router was unable to resolve the IP address given. Check your command line for typos; re-enter the command line with a good address. The correct dotted-quad address notation is *nnn.nnn.nnn.nnn*.

`TCP: Unknown host:` *host_name*

An attempt to set the IP address of *host_name* failed because the Router was unable to resolve the given *host_name* to an IP address. Check routing to the name server, and verify that name service is enabled on the name server. Try entering the IP address of the destination host rather than *host_name*.

`TCP: Host` *ip_addr* `unreachable`

An attempt was made to establish a TCP/IP connection. The specified remote host was unreachable for lack of a physical network connection, or no route was established. Verify that a known-workable Ethernet wire is connected to the Router. Check routing on the Router and the remote host.

A.2.14 TIP Group

`TIP:` *iface* `interface not a serial port`

An attempt was made to open a *tip* session on an interface that is not a serial interface. Check for typos on your command line, correct the *iface* name, re-enter the command line. *tip* can only be used on modems.

`TIP:` *iface* `tip session already active`

A *tip modemx* command was issued at a time when another tip session is in progress. If you determine that a valid *tip* session was initiated elsewhere, wait until it completes; otherwise, you can issue a dialup modemx reset command before again attempting to start your *tip* session.

`TIP: Unknown interface:` *iface*

An attempt was made to *tip* to an invalid interface. Check for spelling of the interface name on the command line. You can display currently valid interface names by entering the *ifconfig* command. Re-enter the command line.

A.2.15 TRACE GROUP

`TRACE: Unknown interface:` *iface*

An attempt was made to *traceroute* to an invalid interface. Check for spelling of the interface name on the command line. You can display currently valid interface names by entering the *ifconfig* command. Re-enter the command line.

A.2.16 TRACEROUTE GROUP

`TRACEROUTE: Connection failed`

The traceroute program failed due to external network conditions. Try again later.

`TRACEROUTE: maximum TTL exceeded`

A *traceroute* command terminated after the time-to-live (TTL) for the IP packet has been exceeded, during the search for a route to the specified host. This message may sometimes appear after manually aborting the *traceroute* command.

`TRACEROUTE: Resolving` *host_name...*

This message is displayed initially after entering the *traceroute* command, while the resolver is attempting to map *host_name* to an IP address. If the mapping is unsuccessful, the message is displayed.

`TRACEROUTE: Unknown host:` *host_name*

An attempt to set the IP address of *host_name* failed because the Router was an unable to resolve the given *host_name* to an IP address. Check routing to the name server, and verify that name service is enabled on the name server. Try entering the IP address of the destination host rather than *host_name*.

`TRACEROUTE: Aborted`

The *traceroute* program was aborted either by the user or by external network constraints.

Appendix B: Dialing Scripts

When configuring a modem for most applications, the standard dialing sequence procedure is recommended. It is more robust and has better error recovery than scripts. When special handling is required, a simple script language is available for writing custom dialer scripts. Both options are described in this section.

NOTE

These options and commands can be used only on modems, not synch.

B.1 Standard Dialing Procedure

The phone number the modem is to dial is entered on the dialup command line, as in the following example:

```
dialup modem0 demand 1-800-555-4141 240
```

Characters allowed in the sequence are:

- number digits 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9
- # and * keys
- comma (,)—indicates a 2-second pause
- P—indicates pulse dialing, or T—indicates tone dialing
- hyphen (-)—this character is ignored
- W—indicates wait for dial tone

For special dialing requirements beyond the scope of the built-in dialer, you can write a custom dialer script. Create the custom script on another system and copy it to the Router boot diskette. If IP is available, use *ftp*; otherwise use the DOS copy utility to put the custom script on the boot diskette. For example:

```
a:stacker a:
copy scriptname a:
exit
```

The *dialer script* command specifies use of that custom script with a particular interface. For example, to specify a *mydialer.dcf* file as a custom dialer script used on interface modem0, enter:

```
dialup modem0 script mydialer.dcf
```

By convention, the suffix *.dcf* is used for dialer scripts. The following descriptions concern dialer scripts. For information about standard dialing procedures without scripts, refer to the *dialup* command (**Section 2.9**).

B.2 Dialer Script Procedure

A dialer script file is a DOS formatted text file in which each line contains one of the following commands:

connect [speed]

Instructs the dialer to wait for the modem to make a connection. From the scriptwriter's perspective, it is equivalent to the command:

wait 60000 "CONNECT" [speed]

but it recognizes modem error messages and will log them to the syslog data stream as:

"call failed: BUSY"

rather than:

"script failed to do 'wait 60000 "CONNECT" ' "

For busy lines, this also allows the call to be retried as soon as the modem detects the busy signal instead of having to wait for a full minute. As for the *wait* command, the *speed* keyword instructs the dialer process to set the DTE port speed to the speed report in the modem's connect message (as in CONNECT 38400). This is not normally required or recommended. The Router sets the port speed when the port is initialized, and this speed stays locked in regardless of connection speed.

control {up | down}

Used to control both DTR and RTS modem signals.

send {*string* | *macro*} [*msec*]

Used to send a text string. Common C-language escape sequences are supported by this command. Use this command to initialize the modem. For example:

send "AT&F\r".

Macro strings may also be substituted for the *string* parameter. The following macro information may be sent:

$PHONE—phone number from **dialup** *iface*
demand *phone*

$LOGIN_NAME—current **dialup** *iface login_name* value

$LOGIN_PWD - current **dialup** *iface login_pwd* value

The optional *msec* argument allows the specified millisecond pause to be inserted between the characters of the output string.

speed *baud*

Used to set the port DTE speed. Normally, the modem ports have speed buffering enabled and the port speed is locked at 38400 bps. The *speed* command can change the modem-port speed. However, if speed buffering, error correction, and compression are turned off, you must also lock the DTE speed to the modem line speed. In this configuration, the maximum usable line speed in "raw" connect mode becomes 9600 bps for the Router because 14400 bps is not a valid DTE speed.

status {up | down}

Used to signal a *connect state* transition to the PPP state machine. For example:

```
send "ATDT 555-6789\r"
wait 45000 "CONNECT" speed
status up
```

Once the connection is made, the status up command will start PPP.

wait

Used to indicate a waiting period before the next action is taken. The three forms are:

wait *msec*

wait *msec string*

wait *msec string* speed

The first form waits for a specified time period in milliseconds.

The second form waits for a specified string; if not seen within the specified time, the command is deemed to have failed.

The third form will expect the specified string. It will then pick a decimal number following that string, and set the port speed to that number.

The same macro strings used in the *send* command may also be used in the *wait* command (*$PHONE, $LOGIN_NAME, $LOGIN_PWD*) in place of the *string* parameter.

NOTE

If a command fails, dialing is considered unsuccessful, and the script will be terminated. The next retry starts the script from the beginning.

B.3 Sample Dialer Script

Consider the sample dialer script:

```
control down
wait 100
control up
speed 38400
send "AT&FS=1&C1&D2&Q5&W\r"
wait 3000 "OK"
send "ATDT8,555-4141\r"
wait 45000 "CONNECT"
status up
```

The action initiated by each command is:

- **control down—**turn off DTR to reset the modem
- **wait 100—**give the system 100 milliseconds to respond
- **control up—**turn DTR back on
- **speed 38400—**set DTE port speed

- **send "AT&FS0=1&C1&D2&Q5&W\r"—**set up modem parameters as:

  &F—reset to factory defaults.

  S0=1—answer incoming calls on first ring.

  &C1—Data Carrier Detect is high when connected to remote modem.

  &D2—disconnect from remote modem when DTR goes low.

  &Q5—Lock DTE speed and enable speed adaptation buffering and error control by the modem.

  &W—Save these values so that they are restored when the modem is reset.

- **wait 3000 "OK"—**wait for modem to be ready
- **send "ATDT8,555-4141\r"—**through PBX: Obtain outside line, place the call
- **wait 45000 "CONNECT"—**Wait for connection to be ready
- **status up—**Start PPP on this line

B.4 Logging into Remote Systems Using Dialer Scripts

Some of the routers and access servers to which the Router can connect open the connection with a *login prompt*. The Router must respond with a *userid* and *password* before the connection can be activated. This is accomplished using dialer scripts.

When determining the script configuration for connection to a remote site, the following basic information is needed:

- the phone number, and what special dialing procedures (if any) are needed for connection.
- the exact wording/spelling of the prompt for user-ID.
- the exact wording/spelling of the user-ID to send.
- the exact wording/spelling of the prompt for password.
- the exact wording/spelling of the password to send.
- the string that is received when successfully connected.

Next, try this sequence by hand-dialing before setting up the script. To hand-dial a connection, first set the dialer to "inactive." Use the *tip* command (described below) to enter each string as you would include it in the script *send* command. Pay special attention to uppercase/lowercase in the prompt strings.

Some systems will prompt for additional information, such as the IP address to use. The format of such items will depend on the system.

There is no substitute for testing the dialog by hand before committing it to software.

B.4.1 Use tip to Test Dialing

To verify modem dialing, use the *tip modemX* command (where *X* is the appropriate modem number) to connect the console terminal or telnet session directly to the modem.

Any dialer on the modem must first be killed. At the prompt, enter:

dialup modem*X* inactive
tip modem*X*

(where X is the appropriate modem number 0, 1, 2, 3, or 4)

Then enter:

AT <RETURN>

and expect to see in response:

```
OK
```

Enter:

ATDT 1-*xxx-yyy-zzzz* <RETURN>

where *xxx-yyy-zzzz* above is the correct dialing sequence for the number being tested. The modem dials the remote Router number and responds with *CONNECT 38400*, followed by a sequence similar to "{.{a{" indicating the other end is trying to start the PPP connect control protocol.

Now set the modem back to command mode by entering:

+++

Wait a few seconds. The response is

```
OK
```

indicating that the modem is now in command mode. Use ATH <RETURN> to terminate the connection. If this works, exit *tip* by pressing ESC, and restart the dialer using the *dialup* command.

B.4.2 Sample Remote Login Dialer Script

The following is an example of how the Router can be configured to connect to a Livingston PortMaster:

```
control down
wait 100
control up
speed 38400
send "AT&FS0=1&C1&D2&Q5&W\r" 100
wait 3000 "OK"
send "ATDT 1-555-426-1888\r"
wait 45000 "CONNECT 38400"
send "\r\r\r" 100
wait 45000 "login:"
send "ppp\r"
wait 10000 "word:"
send "ppp\r"
status up
```

Action initiated by each command is:

- **control down—**turn off DTR in order to reset the modem
- **wait 100—**give the system 100 milliseconds to respond
- **control up—**turn DTR on
- **speed 38400—**set DTE port speed
- **send "AT&FS=1&C1&D2&Q5&W\r" 100—**set up modem parameters
- **wait 3000 "OK"—**wait for modem to be ready
- **send "ATDT 1-555-426-1888\r"—**dial the number
- **wait 45000 "CONNECT 38400"—**Wait for connection to be ready
- **send "\r\r\r" 100—**send return to autobaud remote modem, if needed
- **wait 45000 "login:"—**get login prompt
- **send "ppp\r"—**send userid
- **wait 10000 "word:"—**get password prompt
- **send "ppp\r"—**send password
- **status up—**start PPP on this line

B.4.3 Sample Remote Login Dialer Script Using Macro Strings

Macro strings enable the use of one dialer command file to access many systems with different logins, phone numbers, and passwords. The initial effort to produce the script is reduced and modification is easy. The sample script below causes the same result as the script on the previous page, but has the advantage that it does not need modification if system parameters change.

```
control down
wait 100
control up
speed 38400
send "AT&FS=1&C1&D2&Q5&W\r" 100
wait 3000 "OK"
send $PHONE
wait 45000 "CONNECT 38400"
send "\r\r\r" 100
wait 45000 "login:"
send $LOGIN_NAME
wait 10000 "word:"
send $LOGIN_PWD
status up
```

The **$PHONE** macro sends the phone value previously specified by the command:

dialup *iface* **demand** *phone*

The **$LOGIN_NAME** macro sends the *login_name* value previously specified by the command:

dialup *iface* **login_name** *login_name*

The **$LOGIN_PWD** macro sends the *login_pwd* value previously specified by the command:

dialup *iface* **login_pwd** *login_pwd*

To change a phone number, login name, or login password, simply reissue the appropriate dialer command. The dialer command file remains the same.

B.5 Modem Control Signals

The Router contains an internal modem for each external connection through a telephone line. Data and control signals connect the internal modem and the Router CPU. These signals between the modem and computer parts of the Router may be useful to monitor when troubleshooting problem connections. To facilitate monitoring, some of these signal circuits have LED external indicators. The status of others may be monitored through the software command *asystat*.

The LEDs labeled *Tx, Rx, DTR*, and *DCD* on the modem card at the rear of the Router indicate the following:

Tx—Transmit Data
Flickers when the Router is sending modem commands or data to the modem.

Rx–Receive Data
Flickers when the Router is receiving data from the modem. Also flickers together with Tx when the Router is sending commands to the modem. With some experience, you can get an idea of line use by watching these lights for an active connection.

DTR–Data Terminal Ready
Normally lit if a dialer is active on the modem port. When the dialer is terminated with a dialup modem inactive command, DTR goes off. When DTR is off the modem will not answer incoming calls. When a connection goes idle, the Router hangs up the telephone connection by turning DTR off for a moment until DCD goes off.

DCD–Data Carrier Detect
Sometimes called Received Line Signal Detect, or RLSD. Also referred to as CD. Indicates that the modem has established a data path to a remote modem. The LED is lit when connected and off when listening or dialing.

The status of the other modem control signal can be displayed with the *asystat* command. The signals are:

RTS–originally Request to Send
In the Router, indicates that the Router is able to receive data from the modem. Usually on, except briefly during heavy incoming traffic.

CTS–Clear to Send
Indicates that the modem is able to receive data from the Router.

RI—Ring Indicator
Indicates an incoming call is ringing this phone line. This signal comes on briefly. If DTR is on, the modem will immediately answer.

DSR–Data Set Ready
Generally always on. If *asystat* does not show DSR ON, the modem is probably defective.

CD–Carrier Detect
See the definition for DCD above.

Control the Modem Speaker's Volume

The Router's modem speaker is on by default during call setup. You can control the modem speaker's volume using the *dialup iface volume* {*on* | *low* | *medium* | *high*} command. After invoking the *dialup volume* command, use the *config save* command to save the modem speaker's volume setting. Don't use an *init_string* to control the modem speaker's volume.

Appendix C: Release 4.2 Notes

The 4.2 release operates with the Async Router AR-P (LRA001A-R2), Async Router AR-5 (LRA005A-R2), and the Sync Router (LRS002A-R2), and supports LAN-to-LAN routing and single-user remote node access applications. The following features are available for this release:

New Features, Release 4.2

- **SecurID supported—**SecurID technology is now supported. SecurID is an authentication scheme where users must enter a password plus the number currently displaying on the LCD screen of a personal access card.

- *Doesn't use DES*—SecurID uses EXPORT and doesn't use DES, and so can be used internationally.

  With SecurID remote clients must physically have the SecurID card to access the network, along with a valid username and personal information number (PIN). Also refer to *Appendix D* in the *User's Manual*, and *Sections 2.4* and *2.18* in the *Reference Manual*.

- **RADIUS supported—**RADIUS authentication (Remote Authentication Dial-In User Service) is now supported. RADIUS is an internet protocol (IP) for carrying authentication, authorization and configuration information between an authentication server and a dial-in router such as the Router. RADIUS allows network administrators to have a centralized database for client names and passwords. With RADIUS, client names and passwords reside in one place only, simplifying the administration of clients and increasing the level of security. Also refer to *Appendix D* in the *User's Manual*, and *Sections 2.4* and *2.18* in the *Reference Manual*.

- **tty login for clients supported—***Tty login* is now supported for remote clients, allowing a much wider selection of clients to be used with the Router. Clients calling in get a "login:" prompt, allowing a a user to enter a username/password *before entering PPP*, as an alternative to using PAP or CHAP for validation.

- **IP firewall added—**It is now easier to implement an "IP firewall" for Routers that are used to provide access to the Internet. Release 4.2 enables you to selectively enable a core group of the most commonly-used IP filters, either during initial configuration or by using the *config modify* command. These IP filters are typically used to prevent Internet users from illegally accessing your network, and also reduce overhead traffic associated with domain name service. Also refer to the **config firewall** command in the *Reference Manual*.

- **Ascend Multilink PPP support added—**The Router now supports Multilink PPP between Routers and Ascend routers.

- **new commands added—**New commands since the 4.1 (or 4.1.1) release have been added. Refer to the *Reference Manual* for more details.

- New *generic* commands and subcommands: **authenticate, config firewall, dialup, group, memory, monitor, trace**

- New *IPX-only* commands and subcommands: **ipx, ripfilter, sapfilter**

- New *TCP/IP-only* commands and subcommands: **filter spoof, filter try**

Use Routers to...

- **Achieve multi-application LAN-to-LAN routing solutions.—**Connect separate Local Area Networks (LANs) using analog phone lines, digital phone lines, or both. Connecting networks this way is known as LAN-to-LAN routing. The Router can route both TCP/IP and Novell IPX traffic over its

Ethernet, modem, and synchronous interfaces.

- **Enable up to 100 remote users (modem) to dial into your network over the asynchronous modem interfaces**.—The Router is available with remote node software that allows PC-based users to dial into your LAN using IPX, TCP/IP, or both protocols simultaneously. In addition to the remote node software, PCMCIA and ISA modems are available with the Router, for remote PC and laptop users.
- **Simultaneously support LAN-to-LAN routing and remote users**.
- **Allow simultaneous synchronous and dialup connections**. Router synchronous support includes leased DDS lines and non-leased lines, such as Switched-56.

Sync Router Only

- Synchronous interface supports digital leased lines and Switched-56
- Integrated V.34 modem
- Support for automatic dial backup (fallback) of synchronous lines for IP and IPX—If the NH-Sync+ is configured to use a leased line synchronous interface, the internal modem can be configured to act as a backup to the synchronous leased line. If the leased line fails, the dialup connection comes up automatically and establishes a temporary backup connection.
- The Sync Router is interoperable with synchronous routers manufactured by:

- Cisco

- XYPLEX

- Wellfleet

- Supported CSU/DSUs include (but are not limited to):

For Digital Data Service:

- Black Box/EAZY CSU/DSU MS (part number MT132A-R2)
- LarsE M5600 Multirate CSU
- Motorola/UDS DSS/MR1
- Motorola/UDS DSS/V.32

For Switched-56 Data Service:

- Black Box/EAZY CSU/DSU MS/DBU (SW56) (part number MT134A-R2)
- Motorola/UDS SW56 II

For All Routers

- Provides "canned" filters called Network Link Optimization (NLO). NLO transparently filters unnecessary WAN traffic and reduces telephone costs for IPX networks.
- Provides a remote configuration utility, similar in function to telnet (over IP networks). The RouterVu utility enables you to remotely configure Routers across IPX networks. For remote configuring IP networks, telnet is supported.
- Support for integrated V.34 modems. V.32 bis modems are optionally available.
- IP and IPX routing (separately or simultaneously) using RIP
- PPP, IPCP, IPXCP, PAP, and CHAP protocols
- The Router software contains support for creating and maintaining a database of up to 100 remote clients. The database is managed using the Router's simple configuration interface.
- The Async Client kit contains software (that runs under DOS 3.3+ and Windows 3.1+) that allows remote TCP/IP and Novell IPX nodes to become "remote nodes" on your LAN.
- Simple configuration for all supported interfaces: Ethernet, modem, and synchronous.
- Superior handling of IP RIP updates
- Extensive support for dialup monitoring
- Automatic learning of network topology and services on IP and IPX networks
- Support for primary and secondary phone numbers (used for each modem interface)
- Support for system statistics, using the *performance* command

Outstanding Issues, Release 4.2

Outstanding software issues and suggested workarounds are described below. The number in brackets is the *bug report number.*

Special Outstanding Issues

- No IPXWAN support exists in the Router 4.2 release.
- IPX Fallback only works if TCP/IP is enabled and IP traffic brings up the link the first time. Once a synchronous interface is disconnected, you need IP traffic to bring the modem back up.

Generic Issues

[20134] - The **dialup once** command does not work correctly. Using it will produce the following error message:

```
dialup once: modem0 is busy
```

workaround—Don't use the **dialup once** command. Use the **update** command instead.

[20184] - After using **config modify** to change a LAN-LAN line to a client line, the old IP address of the remote LAN site gets inserted into the optional IP address assigned to the client line.

[20215] - When modifying your Router configuration (using **config modify**), if you respond "n" to the prompt:

```
Do you want to configure and use modemX now?
```

the Router will take the interface down. Use **ifconfig** *iface* **up** to bring the interface back up, or answer "y" to the prompt and accept all of the defaults (if you desire).

[20396] - When no ethernet media is connected to the unit and the command **ifconfig eth0** is entered it indicates that the interface is up and connected.

[20420] - The **update periodic +2** command only works the first time; after that, it never calls back. However, if you specify specific times to call, the update periodic command will work.

[20504] - When entering any phone numbers, do not use parentheses () or spaces to separate digits; use hyphens instead.

[20521] - When using **config modify** to reconfigure the Router, sometimes the Router doesn't prompt you for the authentication method desired (for an interface). Use the **ppp** command to select the authentication method desired for the interface.

[20531] - After you set the syslog address, there is no easy way to set the address back to null. To work around this, you must manually edit the *config.net* file. Contact Technical Support for further instructions.

[20532] - When taking down one type of Ethernet frame, the other Ethernet frame types become "deaf." To recover, execute **config save** and then restart the Router.

[20538] - If you are having problems with a dialer operation on your Router, enable **syslog** on your console, and look at the error messages.

[20541] - When starting the Router, ignore the following messages:

```
spawn dk86965 returned -1, errno=2
Packet driver not loaded at INT125
```

[20557] - When using **telnet** or **routervu** across a link, sometimes telnet and RouterVu appear to have stopped. Wait at least 5 minutes before re-establishing the connection, because often telnet and RouterVu will recover in that time.

[20565] - When using the **ppp** command, use the full name of the subcommand, because ppp doesn't always accept partial names for subcommands.

[20595] - The **who** command displays telnet servers, ftp servers and ppp sessions, but not console logins.

[20660] - Although it is possible to use *root* as the name of your Router, don't use it. If you use *root* as the name of your Router, your will have problems changing the name in the future.

TCP/IP Mode Issues

[2762] - If a non-existent or downed *syslog* server is configured for the Router, the Router may continually try to reach the syslog server over the interface.

[20227] - The Router's telnet expects a carriage return plus a line feed for each line, and some emulators (Microsoft TCP/IP Telnet) can't do this.

workaround—Use another telnet application instead.

[20391] - ***ftp*** to Router using *PCNFSpro* windows ftp client does not show any files when you've successfully logged in and use the **dir** command.

[20540] - To remove an IP firewall, use **config firewall** instead of **config modify**.

[20561] - Sometimes TCP port displays show negative numbers. Numbers above 2^{15} (32768) will be displayed as negative numbers.

[20682] - When a remote client connects, a syslog message appears to present the client's password. What is presented as the password (in the message) is the client's username. The password is never sent to syslog.

PPP Issues

[20584] - The syslog on the Router shows an error message *unknown ppp packet error* when a Windows95 machine logs onto the Router using SecurID. Login is successful but an error message is displayed once.

[20585] - If the unit is configured with **dialup modem*X* logprompt on** and **ppp modem*X* lcp local auth none** then the client will see a login prompt. If using login/password when the prompt fails, the call will be cleared, but if the client goes directly to PPP, no validation is performed. To perform validation, select either CHAP or PAP. User must not set **auth none**. A later release issues a warning if the log prompt is set to **none**.

IPX Mode Issues

[20271] - The **ripfilter** and **sapfilter** status messages do not display the maximum number of hops allowed by the filter.

[20272] - When using the **-h** option of the **ripfilter** and **sapfilter** commands, the entries with hops greater than the specified number are not deleted from the sap and route tables automatically. The entries are only removed when the sap or route tables are flushed.

[20568] - **SPX spoofing** doesn't work correctly with the Router, unless you install a patch on your NetWare server.

workaround—The NetWare 4.1 Server contains a bug, which can be fixed by a patch named WATDOGFX.NLM. This patch is available on Novell's NETWIRE server (http://www.novell.com/) as part of a larger patch kit named 410PT3.EXE (4.10 patch kit 3).

Remote Client Issues

[20588] - Remote Office Gold client fails to log in if the Router has login prompts enabled and clients are not using it.

[20619] - If the baud rate on a Router's analog modem is set too high (28.8K), then Remote Office will not be able to log in (using tty mode). Lower the baud rate to allow the Remote Office client to log in.

[20682] - See previous write-up in *TCP/IP Issues*.

SecurID Issues

[20584] - See previous write-up in *PPP Issues*.

Windows 95 Issues

[20584] - See previous write-up in *PPP Issues*.

[20593] - Windows 95 clients logging in often miss parts of the prompts in the tty window.

Workaround—Limit the port speed to 57600.

[20646] - The Windows 95 remote client cannot see the foldernames or files on the remote server.

Workaround—On your Windows 95 client machine, go into the control panel, select the Networking icon, then the Dialup Adapter icon. Click on Properties/Advance/IPX Header Compression. Set the header compression to "no." Now reconnect to the remote server.

RouterVu Issues

[20614] - RouterVu (v1.15) doesn't interoperate with Novell's Beta Win32 NetWare client (dated 12/12/95). Call Technical Support for the latest developments.

NetWare Dialup Considerations, Release 4.2

When using the Router's built-in modems, there are two main areas of concern when using NetWare over a *dialup* line: possible user confusion and using NetWare Directory Services.

Using NetWare Over Modem Lines

Using NetWare over modem lines on a dialup network may confuse users accustomed to running NetWare only across Local Area Networks (LANs).

Users will first notice a reduction in performance.

Users may also notice that some applications may time out while the Router is establishing a phone connection. This can happen when the Router first boots, and can also happen once a dialup connection has been established but has timed out because of inactivity. In both situations the following message will be displayed on the client while the Router dials and establishes a new dialup connection:

```
General Failure Error reading device NETWORK
Abort, Retry, Fail?
```

This occurs because the Router takes 20 to 45 seconds to establish a modem connection. Netware clients time out after 20 seconds. To prevent this from happening, modify the *net.cfg* file on the NetWare client to set the IPX retry count to 60 by adding the following line under "Link Support":

```
IPX retry count = 60
```

Users may notice that some applications keep the dialup link up by polling or by sending other traffic. It is IMPORTANT to monitor your phone line whenever setting up the Router for the first time or when using new applications. For more information about the **dialup quota, dialup dial_log**, the **trace** *iface* **up**, and other related commands used for monitoring phone line usage, refer to the *Reference Manual*.

Reconfigure Your Local VLM-Based Clients

We recommend using the "preferred server" option whenever possible. To do so:

1. In each NetWare 4.x (VLM-based) client, add the following line to their NET.CFG file:

```
PREFERRED SERVER = local_server_name
```

   where *local_server_name* is the name of your local server.

2. Reboot the client and reload the NetWare workstation software.

3. Verify that connecting to the local server is immediate and that the Router doesn't dial.

How to Upgrade to Release 4.2

A software kit for release 4.2 includes:

- Router SmartRoute release 4.2
- This manual

There are two procedures for upgrading a Router, depending upon whether custom dialer scripts are used or not:

- The Router doesn't use custom dialer scripts (use method 1)
- The Router does use custom dialer scripts (use method 2)

Follow method 1 or method 2 to upgrade your Router.

Method 1: If you don't use custom dialer scripts (standard configuration)

If your Router is currently operating without the use of a custom dialer script (i.e., if you chose "Router" as the modem peer during configuration), follow the steps outlined below to upgrade from your release to the 4.2 release:

1. Log in to the Router, and enter:

   `config show`

   Record the line that looks like:

   `dialup` *iface* `speed` *bps*

2. Remove the current boot diskette from the diskette drive.
3. Verify that the write-protect "window" on the release 4.2 boot diskette is closed, allowing information to be written to the disk. Insert the release 4.2 boot diskette into the diskette drive and enter:

   `config save`

4. Reboot the system by entering:

   `reboot`

   Ignore any dialup error messages that may be displayed on the screen.

5. If in Step 1, you saw lines that looked like

   `dialup` *iface* `speed` *bps*

   then enter **ifconfig** *iface* **speed** *bps*. (Don't use the **dialup** *iface* **speed** *bps* command.)

6. Enter:

   `config save`

7. Log off of the Router by entering:

   `logoff`

Method 2: If you do use custom dialer scripts

If your Router uses a custom dialer script to connect to a peer router (i.e., if you chose Livingston,

Telebit, or other as the modem peer during configuration), the script file from your current configuration must be copied to the 4.2 release boot diskette so that it may continue to be used. Complete the steps below to upgrade a currently operational Router from your previous release to the 4.2 release.

The filenames for the standard dialer scripts included with the Router are *netbl.dcf, portm.dcf* and *other.dcf*. If your Router has been using custom dialer scripts, contact your network administrator to find out what the filenames are. Or, you can issue the **config show** command and look for entries like **dialup** *iface* **script** *file*, for example:

```
dialup modem0 script netbl.dcf
```

Note the dialer script filenames and record them.

1. Perform this step, depending on whether you have access to the boot diskette and a DOS-based PC, or are using *ftp* over a TCP/IP network to transfer the script to another host (for editing).

If you have the boot diskette and prefer to use a DOS host...

Use a separate DOS machine and the DOS copy command to transfer the dialer script files from the old (3.x) boot diskette to the new (4.2) boot diskette.

Insert the old (3.x) diskette into the DOS machine and issue the following commands:

```
mkdir \nh
copy a:netbl.dcf \nh
```

Insert the new (4.2) diskette into the DOS machine and issue the following command:

```
copy \nh\netbl.dcf a:
```

Answer **yes** to overwrite a query.

If you do not have the boot diskette and prefer to use a host over a TCP/IP network...

Copy the dialer script file to a host computer; to do this, **ftp** (IP required) from a host computer and log in to the Router as *root*.

Copy the dialer script file from the boot diskette to a directory on the hard drive of the system upon which you are running *ftp*.

As an example, on a Sun UNIX system, issue the following commands:

```
mkdir /tmp/nh
ftp nh_ipaddr    (Use the Router's IP address)
```

Use the *get* option of *ftp* as follows:

```
ftp> bin
ftp> get \netbl.dcf /tmp/nh
ftp> quit
```

The *netbl.dcf* file is stored on the Sun machine until step 6.

Close the **ftp** session.

2. Login to the Router and enter:

```
config show
```

Record the line that looks like:

`dialup` *iface* `speed` *bps*

3. Remove the current boot diskette from the diskette drive.

4. Verify that the write-protect "window" on the release 4.2 boot diskette is closed, allowing information to be written to the disk. Insert the release 4.2 boot diskette into the diskette drive and enter:

```
config save
```

5. Reboot the system by entering:

```
reboot
```

Ignore any dialup error messages that may be displayed on the screen.

6. Perform this step, depending on whether you have access to the boot diskette and a DOS-based PC, or are using *ftp* over a TCP/IP network to transfer the script to another host (for editing).

If you have the boot diskette and prefer to use a DOS host ...

Put the 4.2 diskette back into the Router and log in to the Router as *root*. Continue to Step 7.

If you do not have the boot diskette and prefer to use a host over a TCP/IP network...

Restore the dialer script. To do this, *ftp* (IP required) from the host computer to the Router. Log onto the Router as *root*. Transfer the saved dialer script files using the *put* option of *ftp*. They will be stored on the boot diskette.

For example, on a Sun UNIX system, issue the following command:

```
ftp nh_ipaddr
```

Use the *put* option of *ftp* as follows:

```
ftp> bin
ftp> put /tmp/netbl.dcf \netbl.dcf
ftp> quit
```

The script is now restored on the Router.

7. If in Step 2, you saw a line that looked like

`dialup` *iface* `speed` *bps*

then enter `ifconfig` *iface* `speed` *bps*. (Don't use the `dialup` *iface* `speed` *bps* command.)

8. Save the new configuration by entering:

```
config save
```

9. Log off of the Router by entering:

```
logoff
```

How to Make Previous Releases Compatible with Release 4.2

To allow one Router running release 4.2 to correctly work with another Router running a pre-4.2 release, perform the following procedure.

1. On the two Routers connected together (via a phone line) enter:

   ```
   dialup modemX status
   ```

   where modemX is

   modem0 on an AR-P or Sync Router,

   and modem0 – modem4 on an AR-5.

   For an AR-5, repeat the procedure for each configured modem interface and its peer. The dialup line above will output a message like:

```
(tcp/ip)croy> dialup modem0 status
modem0: (28800/V1.000-V34-DP)
    DTR On  RTS On  CTS On  DSR On  RI Off  DCD Off
    demand   listening        Timeout: 240       Idle: 0:00:2:16
    Remote phone: 14
    Total time con: 0:01:36:13  Time since last boot: 5:03:59:32
    Average daily connected time: 0:00:18:37
    Daily quota: 1:00:00:00   Used: 0:00:14:09   Left: 0:23:45:51
    Usage warning currently set at: 0:04:00:00
(tcp/ip)croy>
```

2. Look for *demand_backoff* or *demand* on the first line of the output. One Router should have *demand_backoff* and the other should have *demand*. If this is the case, you are done.

   If both Routers have *demand*, enter (on one of the Routers):

   ```
   dialup modemX demand_backoff
   ```

   If both Routers have *demand_backoff*, enter (on one of the Routers):

   ```
   dialup modemX demand
   ```

3. Issue the **config show** command on the pre-4.2 Router.

4. Look for lines that start with *ipx wan*, or this exact line:

   `ipx internal_net` *net_number*

5. If you find such lines, enter the following line for the corresponding interface:

   `ipx ipxwan` *iface* `disable`

   IPXWAN is no longer supported on the Router. IPXCP will be used as the default.

6. On the Router that you changed, enter:

   ```
   config save
   ```

   The two Routers are now ready to route.

Using Analog Leased Lines?

If your site requires 2 or more hours per day of continuous connection time, it may be less expensive to lease a 2-wire voice-grade line and keep the link up all the time, rather than using a dialup connection.

Although telephone companies often offer several types of leased lines, it is important to select a type of leased line that is supported by the Router modem. The types of lines offered differ from telephone company to telephone company, as do the names by which they are referenced.

Here is a description of some commonly used types of lines, and whether they can be used with the Router's V.32 bis or V.34 modems.

1. Ringdown line

   A ringdown line works well with the Router's V.32 bis and V.34 modems.

   This type of leased line is often used in applications like airport hotel hotlines: You take one of the telephones off the hook, and the other telephone rings. In many places a local ringdown line is offered for less than the cost of two regular business lines.

   A line provisioned with ringdown works as follows:

   When one end of the connection picks up the phone, the ringdown circuit automatically generates ring voltage on the line. At the other end of the line, the phone (or modem) detects ring just like a normal phone call. The major difference between a line provisioned with ringdown and a normal PSTN phone line is that the ringdown line is point-to-point, and no dialing is required. Typically, ringdown is provisioned for only one end of the connection, resulting in one end being assigned as the originating party, and the other end being assigned the role of the answering party.

   To use V.34 modems on a line provisioned with battery and ringdown, use the following dialup command:

   `dialup modemX init` *existing_init_string* `X3`

   Adding the **X3** modem command to the modem's init string tells the modem not to look for a dialtone when going offhook.

   For the originating side of the connection, enter

   ```
   dialup modemX demand -
   ```

   Where (-) represents a null phone number.

   For the answering side of the connection, enter

   ```
   dialup modemX incoming
   ```

2. Leased line with battery voltage and no signaling

   A two-wire leased line with battery (for loop current) **and no signaling** (no ringdown) will work with the Router's V.32 bis modem. It will not work with the Router's V.34 modem.

   Use the Router's **dialup** commands to support each end of the connection. Assign one end of the connection to be the originator of the dialup connection, by using the command:

   ```
   dialup modemX leased_originate
   ```

   Assign the other end of the connection to be the answering side of the dialup connection, by using the command:

   ```
   dialup modemX leased_answer
   ```

3. Leased line with no battery or signaling

A leased line with no battery or signaling will not work with the Router's V.32 bis or V.34 modems.

Sometimes called a "dry pair," this type of line is often provisioned for a local connection. If this is the only type of line offered, you can augment it with a separate "ringdown box," in order to turn it into an equivalent of a ringdown line (described previously).

4. 4-wire leased line

A 4-wire leased line will not work with the Router's V.32 bis or V.34 modems.

Connecting to an Internet Service Provider (ISP)?

Before configuring your Router to connect to an Internet Service Provider (ISP), obtain the following information from your Internet Service Provider.

Intended IP addresses at your site.

- Your Router's IP address
- The set of IP addresses available for hosts on your LAN
- Subnet masks used
- The IP addresses of any domain name servers

The system at the ISP that the Router will connect to, using the PPP protocol.

- The type of system to which your Router will connect to
- Custom dialing script, if required
- The IP address of that system
- Username and password
- If PAP or CHAP is used, the name and password required for authentication

At the end is a sample dialer script. The following sections provide more detail.

Intended IP addresses at your site

- Your Router's IP address

  You do not need a separate IP address for the modem interface in your Router. The same IP address assigned to your Router is the one used by your modem interface.

- The set of IP addresses available for hosts on your LAN

  Depending on your LAN requirements, you may be assigned a whole class C address (e.g. 204.125.5.xxx), or a smaller set of IP addresses (e.g. from 204.125.5.17 to 204.125.5.23).

- Subnet masks used

  You must specify the subnet mask to be used.

- The IP addresses of any domain name servers

  You can have domain name servers at the ISP site or on your LAN.

The system at the ISP that the Router will connect to, using the PPP protocol.

- The type of system to which your Router will connect.

  The Router configuration process includes options to configure your Router to connect to some other popular routers, like the Livingston Portmaster or the Telebit Netblazer or PN. Ask your ISP if you will be connecting to any of those, and if so, choose the corresponding configuration option for your Router during initial configuration.

  If the ISP system is not a Router, Livingston Portmaster or the Telebit Netblazer or PN, then you must create a dialing script for the Router. Obtain from your ISP a sample dialer script, or modify the *other.dcf* file on the Router diskette.

  The Router provides this information by means of a dialer script. The Router will build the script for systems like the Livingston Portmaster or the Telebit Netblazer or PN.

  If your Router is connecting to an Ascend system, at the Router prompt, issue the following commands:

  ```
  ppp iface lcp local accm 0xa0000
  ppp iface lcp local acfc off
  ppp iface lcp local pfc off
  config save
  ```

- The IP address of that system

  This often called the "Router's peer" IP address.

- Username and password

  Most ISPs will give you a username and a password that will be used to authenticate your Router at the time the connection is established. Your ISP's system will ask the Router for this information. The username and password must be in the dialer script used by the Router. If you choose to connect to a Router, Livingston Portmaster or the Telebit Netblazer or PN, the Router configuration process will put the username and password into the dialer script for you.

- If PAP or CHAP is used, the name and password

  Ask your ISP if they will be authenticating your Router using the PAP or CHAP protocols. If your ISP will not be using PAP or CHAP, then answer NONE when the initial configuration process asks for authentication method. No other work is required. If your ISP will be using PAP or CHAP, you must configure your Router to use PAP (or CHAP).

  PAP and CHAP authentication works in either or both of two ways: the ISP's system can request your Router to authenticate itself (using PAP/CHAP), and/or your Router can request your ISP's system to authenticate itself (using PAP/CHAP). In other words, their system can authenticate your system, or your system can authenticate their system, or both.

  ISPs typically configure their systems to authenticate customers trying to establish connections with them (such as you with your Router). However, ISPs typically do not configure their systems to authenticate themselves to customers.

  To configure the Router so that it will authenticate itself to the ISP's system, and not require the ISP's system to authenticate itself to the Router, answer NONE when prompted for the authentication method that you wish to use, during the configuration process.

  After finishing the initial configuration process and rebooting, enter the following command at the Router prompt:

  ```
  ppp iface pap user [username] [password]     (for PAP)
  config save
  ```

or

```
ppp iface chap user [username] [password]        (for CHAP)
config save
```

where *iface* is the modem interface that you are using to connect to the ISP (modem0, modem1, etc.) The [*username*] and [*password*] are the PAP/CHAP authentication name and password. The config save command will save these PPP commands to the Router's boot diskette, and these commands will be executed automatically after every reboot.

If your ISP requires your Router to authenticate the ISP's system, then during the configuration process, answer PAP or CHAP when asked for authentication, and enter the name and password that you will use to authenticate your ISP's system, when asked for the name and link password of the remote system that you are connecting to.

Sample dialer script

If your ISP is using a different system, choose

```
5) Other LAN to LAN
```

from your configuration options. You will later be prompted for the name of a dialer script file. Often you can obtain from your ISP a sample dialer script that you can modify to create a dialer script file for the Router. Included on the Router diskette is a sample dialer script file called *other.dcf,* which you can modify to create your own dialer script, or use as a template.

Example dialer script:

```
send "AT\r"
wait 1000 "OK"
send $PHONE
connect
send "\r\r\r" 100
wait 10000 "login:"
send $LOGIN_NAME
wait 10000 "password:"
send $LOGIN_PWD
wait 10000
send "ppp\r"
status up
```

The scripts will be different in different systems. For example, your ISP's system may ask for "username:" instead of "login:", as in the example. In that case the line

```
wait 10000 "login:"
```

in the script above would be substituted by:

```
wait 10000 "username:"
```

In the same way, the system may prompt for a password in different ways.

The variables $PHONE, $LOGIN_NAME, $LOGIN_PWD in the script above will contain the values of the phone number, your username and password that you entered when you configured the Router. You can use these variables for the phone number, username, and password in your dialer script, or you can write their values directly. For example, you can substitute the line

```
send $PHONE
```

by

```
send "ATDT 345-6789\r"
```

In order for the Router to establish a PPP connection with the ISP's system, the Router has to indicate to the ISP's system that it wants to establish this kind of connection. In the dialer script example, the command **send "ppp\r"** indicates this desire. For some systems, you may only need to send one p character to produce the same effect, such as **send "p/r"**.

For other systems, you may need to login using a special username that starts with capital P, with no need to send any special commands after the login process is done. In this case, enter a username that starts with "P" when prompted for your username during the Router configuration process.

Also, some systems can be set to automatically go into PPP after the login process is completed, and for these systems, you do not need to send any **ppp** commands or use any special usernames.

1000 Park Drive • Lawrence, PA 15055-1018 • 724-746-5500 • Fax 724-746-0746